NATURAL GAS NUMBER

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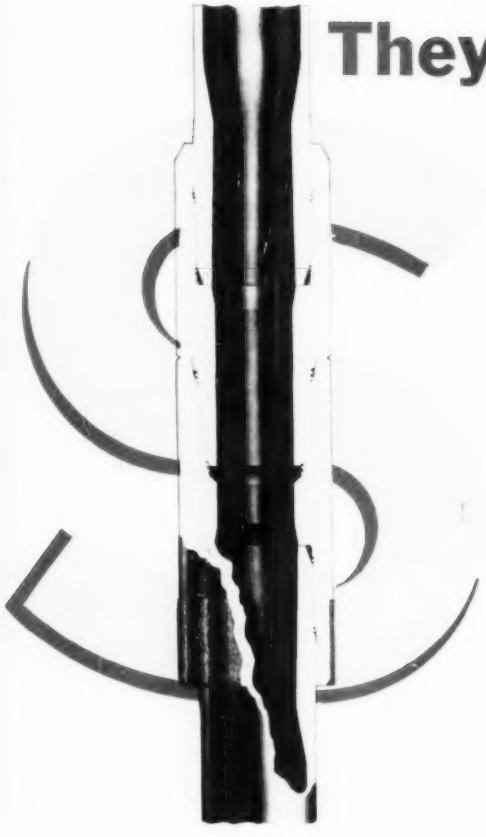


They save you money!

- Drill pipe lasts longer
- Tool joints last longer
- Drill strings are safer
- Tool joint replacement costs are reduced

REED

Super Shrink-Grip

TOOL JOINTS

ASK YOUR
REED REPRESENTATIVE

REED ROLLER BIT COMPANY
HOUSTON 1, TEXAS

PRICE 50 CENTS TABLE OF CONTENTS PAGE 51 MAY 4, 1950

KEEP UPKEEP DOWN

Hypermatic

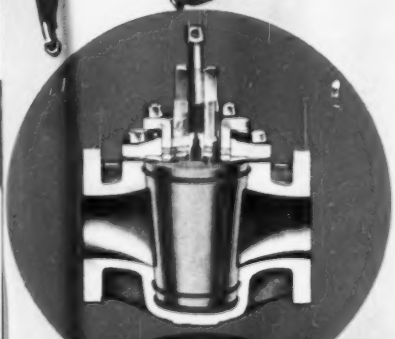
TRADE MARK

The MIRACLE VALVE LUBRICANT

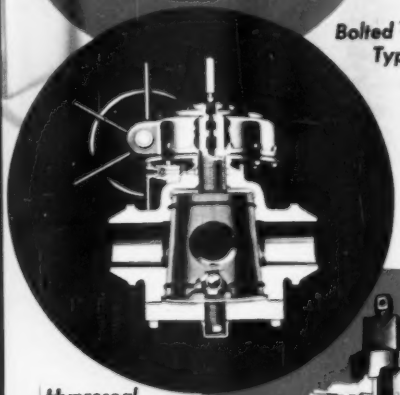
PATENTS APPLIED FOR

Establishes Amazing Performance Records

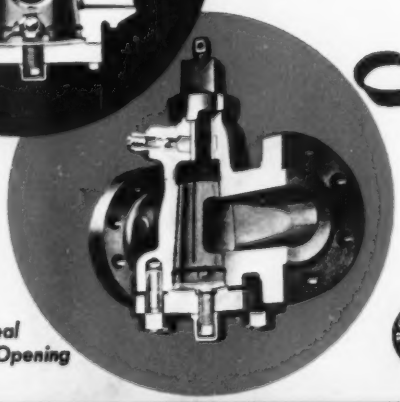
● Since the introduction of Rockwell Hypermatic lubricant six months ago, thousands of operators of Nordstrom valves have had an opportunity to use it. Comparative tests prove tremendous savings in maintenance time. Operation records show increased efficiency, greatest ease in opening and closing the valves—and most important, full *automatic* lubrication. If you have not changed to Hypermatic, do so at once—you'll note a tremendous improvement. Hypermatic adds to Nordstrom valves now in use a vastly improved principle of lubrication that further reduces your valve maintenance costs and automatically prevents leakage.



Bolted Gland Type



Hypreseal Round Opening



Hypreseal Rectangular Opening

Nordstrom Valves

Nordstrom Valve Division

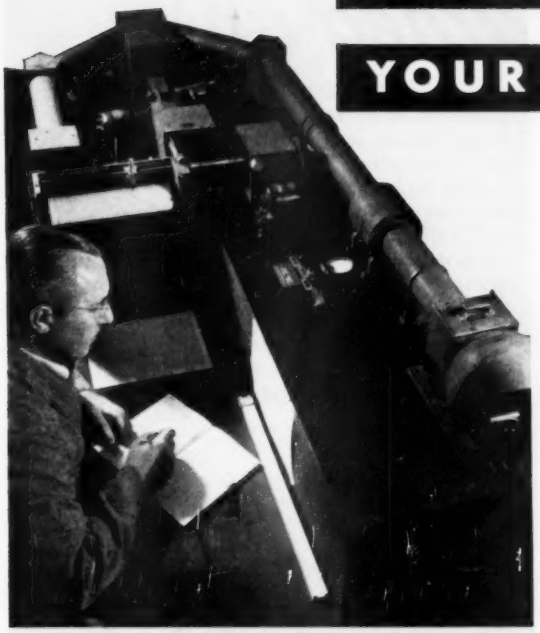
ROCKWELL MANUFACTURING CO.

400 N. Lexington Ave., Pittsburgh 8, Pa.

District Offices in All Principal Cities

COLOR-IDENTIFY YOUR GASOLINE...

from the complete line of Du Pont Gasoline Dyes



Recording spectrophotometer tells the complete story of a color—its strength, shade and brightness—in writing. It is used to standardize Du Pont Gasoline Dyes, assuring the refiner of uniform tinctorial properties.

Du Pont Gasoline Dyes have been developed to meet the demands of the Petroleum Industry for dependably uniform colors, and are today accepted as standard.

Possessing hi tinctorial strength and good solubility, the four Du Pont Gasoline Dyes may be used independently, or mixed, to obtain virtually any shade or color desired.

Du Pont District Laboratories, conveniently located throughout the country, will be glad to make recommendations as to the mixture and quantity of each dye needed to arrive at the color you desire. They will also work with your laboratory on other additive recommendations. Write or call your nearest Du Pont District Office. Ask for samples.

APPROXIMATE SOLUBILITY OF DU PONT GASOLINE DYES
at 60° F.—Grams/Gal.

	Oil Yellow N	Oil Orange	Oil Red	Oil Blue A*
Straight Run Gasoline	27	24	12	8
Aviation Gasoline	24	25	6	7
Thermal-Cracked Gasoline	42	44	13	13
Catalytic-Cracked Gasoline	72	66	23	12
Benzene	832	242	114	300

*Du Pont Oil Blue A is the new, high tinctorial strength blue gasoline dye, 35% stronger than the previous Du Pont Oil Blue and several times more soluble. Meets requirements of Specification MIL-F-5572 and may be used in aviation gasolines intended for military use.

DU PONT
REG. U.S. PAT. OFF.

Better Things For Better Living
...Through Chemistry

Petroleum Chemicals

Make Du Pont the Source for All of Your Gasoline Additives ... Tetraethyl Lead Compounds (Motor Mix—Aviation Mix)—Antioxidants—Metal Deactivator—Dyes

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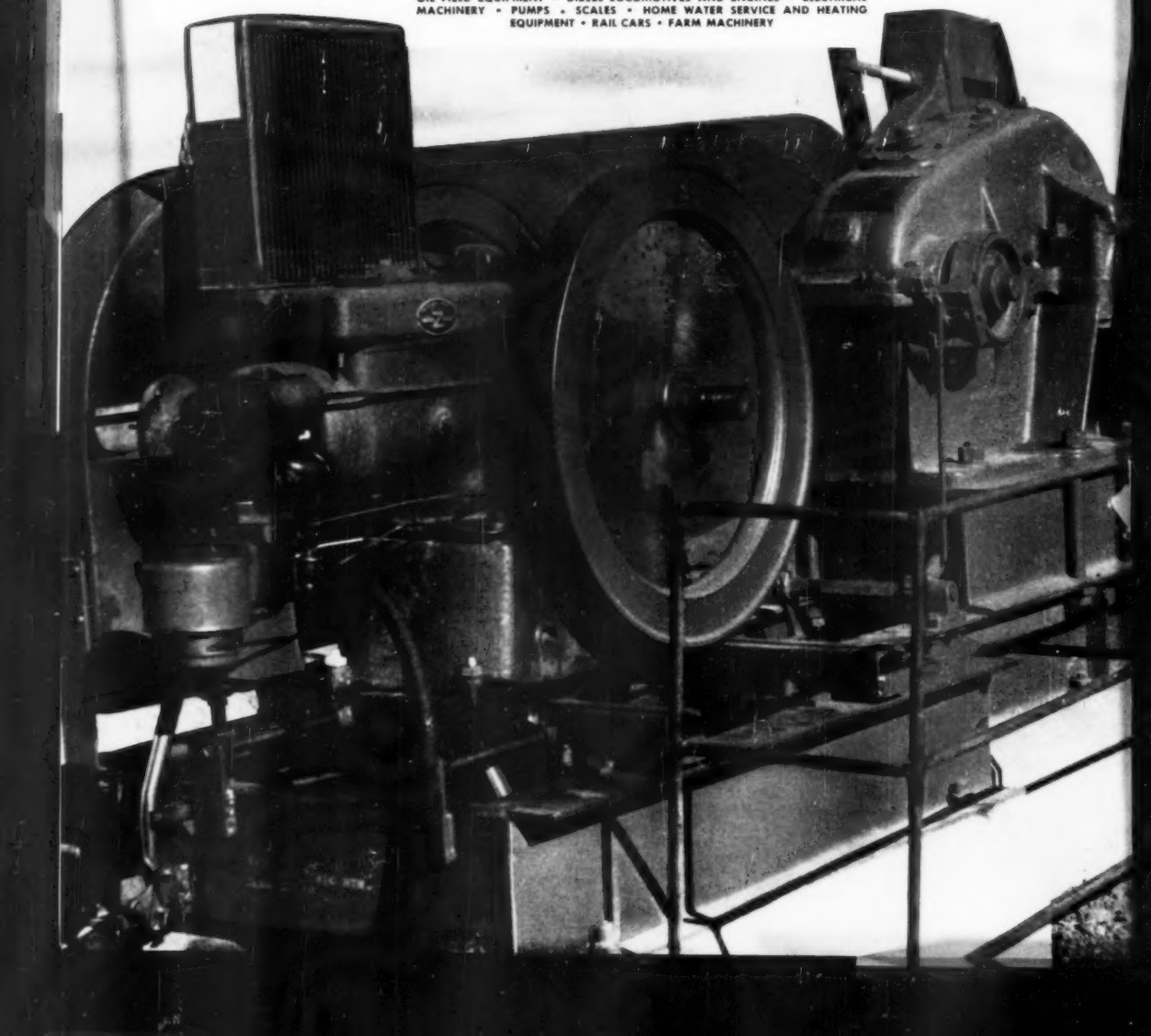
THEY DON'T GET "Burned-up"

You don't have to worry about "burning up" a Fairbanks-Morse "ZC" Engine by overloading it. The automatic intake valve automatically limits the amount of horsepower the engine can deliver. The admission of the air and gas mixture is restricted beyond a predetermined point. This feature, plus the extra heavy flywheels, prevents the engine from being intermittently overloaded or underloaded. It's impossible to burn up the engine in a short time by accidentally overloading it. This is just one of the many features that keep a "ZC" running long after the ordinary engine has worn out . . . why many "ZC's" are still in service after more than two decades of service. Check them at your supply store. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE,

a name worth remembering

OIL FIELD EQUIPMENT • DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE AND HEATING EQUIPMENT • RAIL CARS • FARM MACHINERY



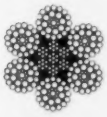
Whatever the job

6x7 rope is made with 7 wires in each of 6 strands around a fiber core or a steel core. It may be bright or galvanized steel, stainless steel or monel metal. Uses are for haulage, guying, sand lines, core barrel lines, rigging, controls, etc.

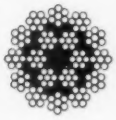
7x19 is made with 7 strands of 19 wires each, one strand forms the core. It is widely used for corrosion-resisting wire rope of galvanized steel, stainless steel and monel metal. Widely used for aircraft controls and for miscellaneous hoisting and controls.

6x19 classification is made with wire combinations varying from 16 to 26 wires in each of 6 strands. Supplied *PRE*formed or non-*PRE*-formed, Lang Lay or Regular Lay, with fiber core, or steel core in bright and galvanized steel, stainless steel and monel metal. It is one of the most widely used ropes for general hoisting, cranes, excavating equipment, haulage, mining, logging and rotary drilling. Illustrated is a cross-section of 6x19 filler with I.W.R.C.

select the right wire rope for your equipment from



6x37 group has various types with wire combinations ranging from 26 to 46 wires in each of 6 strands. Supplied *PRE*formed or non-*PRE*-formed, Lang Lay or Regular Lay, with fiber core or steel core. It is extremely flexible and has many uses for hoists, ladle cranes, coal cutting machines, winches, dredges, excavating equipment, etc. Illustrated is a cross-section of 6x41 I.W.R.C.



18x7 is made as illustrated with 18 strands of 7 wires each and supplied *PRE*formed. It is a non-rotating "Kilindo" rope made by combining two opposing lays of rope. Its principal use is for hoisting with a single line to overcome rotating or spinning of the load. It is desirable for small shop and warehouse electric hoists, and for sewer, subway and mine shaft work.

8x19 is an extra flexible rope made in various wire combinations. It is used in iron and special traction grades for passenger and freight elevator service, and in Monarch Whyte Strand Improved Plow Steel for many and varied purposes where the rope is not subjected to heavy crushing loads. Illustrated is 8x19 Seale Special Traction Elevator Rope.

A thousand and one
WIRE ROPES
made by
MACWHYTE

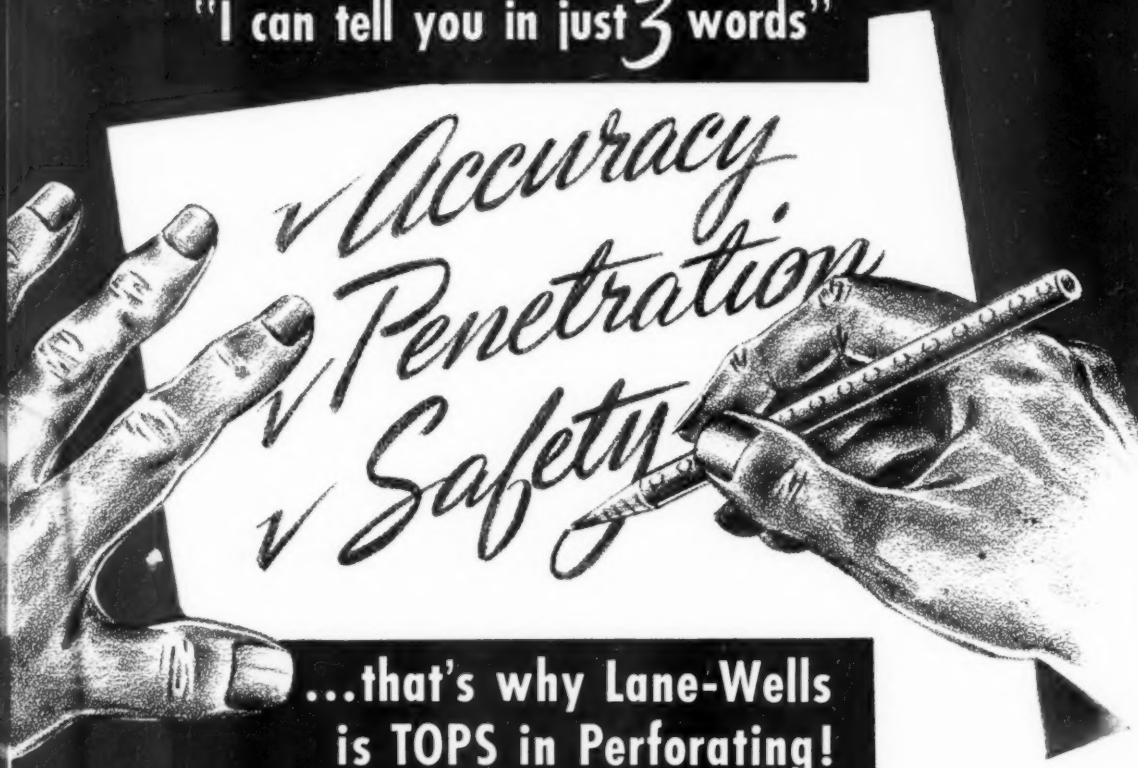
Putting the right wire rope on your equipment puts dollars in your pocket

Perhaps you have several uses for wire rope. Perhaps there are several types of rope you could use. But for better service, lowest operating cost, you should get a specific recommendation for each job. Tell us what equipment you have, how you use it, and the size and type of rope you are now using. Take advantage of our specialized wire rope experience with all types of equipment. Get specifications for the correct rope to use on each machine you have. Just call a Macwhyte distributor or write direct to Macwhyte Company, Service Department, Kenosha, Wisconsin.

MACWHYTE WIRE ROPE

MACWHYTE COMPANY 2916 Fourteenth Avenue, Kenosha, Wisconsin Manufacturers of Monarch Whyte Strand PREformed, Internally Lubricated Wire Rope, ATLAS Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal and Stainless Steel Wire Rope. Catalog on request. Mill Depots: New York • Pittsburgh • Chicago • Minneapolis Fort Worth • Portland • Seattle • San Francisco • Los Angeles

"I can tell you in just 3 words"



...that's why Lane-Wells is TOPS in Perforating!

Talk to Lane-Wells' customers—ask them *why* they use Lane-Wells perforating—and their answers will boil down to these three words. And here are the reasons: • LANE-WELLS DEPTH MEASUREMENTS are accepted, industry-wide, as the standard of accuracy because Lane-Wells has taken pains to see that they *are* accurate. Each conductor cable has been individually calibrated and marked, and, as a double check, a collar locator signals the passing of selected casing collars. The measuring sheaves over which these cables run have, built-in, micrometer adjustments to compensate for even the slightest wear. • LANE-WELLS GETS PENETRATION because for every job, there is a Lane-Wells gun that is just right, the right bullet, the right propelling charge. There are six different *types* of bullets, in diameters ranging from $\frac{1}{16}$" to $\frac{9}{16}$" driven from firing chambers which utilize the peak efficiency of the fibre-packed, accurately-metered powder. KONESHOT charges and guns are available for either open or cased hole jobs. • LANE-WELLS' ENVIABLE SAFETY RECORD is due, in part, to the safety-precautions built into the equipment—such as the five-point safety firing system, which insures that the gun is never "live" except down the hole, in the firing location—and in great part to the ability, the thorough training, and the wide experience of all the Lane-Wells crews.

Ask a Lane-Wells Customer about

LANE WELLS

AG-304

Better Perforating

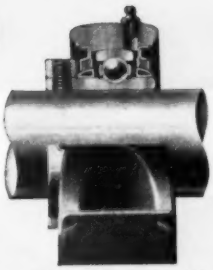
LOS ANGELES • HOUSTON • OKLAHOMA CITY

General Offices, Export Office and Plant

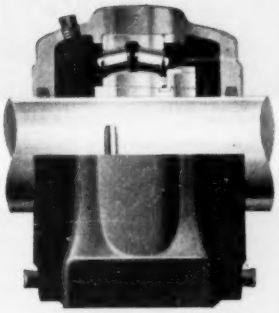
5610 SO. SOTO STREET, LOS ANGELES 58, CALIFORNIA

LANE-WELLS CANADIAN COMPANY • IN VENEZUELA PETRO-TECH SERVICE CO.

Lock a LINK-BELT Ball or Roller Bearing to your shaft



BALL BEARING—SERIES 200



ROLLER BEARING—SERIES 6800

without distortion

because . . . the set screws are not threaded into the inner ring of the bearing. The spring-locking collar, or the tapered sleeve, clamps the bearing to the shaft.

with firm grip

because . . . of the "hoop tension" of the spring-locking collar, or the tight grip of the tapered sleeve.

without mislocation

because . . . the spring-locking collar is factory assembled and permanently located in correct position on the bearing.

regardless of rotation

because . . . of symmetrical locking. Two simple operations securely lock a LINK-BELT bearing. Simply slip on shaft; then tighten two set screws, or pull up the locknut.

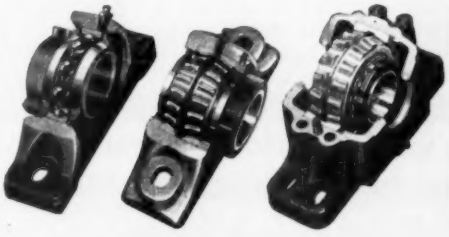
with wide distribution of bearing load

because . . . the wide inner ring of the bearing, or the tapered sleeve, provides a large area of shaft contact.

May we send you the new Link-Belt Ball and Roller Bearing Catalog No. 2550, containing complete data useful in design and replacement? Link-Belt engineers are quickly available to discuss your bearing problems. Contact the nearest office.

LINK-BELT COMPANY Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities. 11,700

A complete line of bearings is available from stock, throughout the country, in pillow blocks, cartridge, flanged cartridge, flanged, hanger and takeup blocks —also unmounted bearings.



LINK-BELT

BALL & ROLLER

BEARINGS

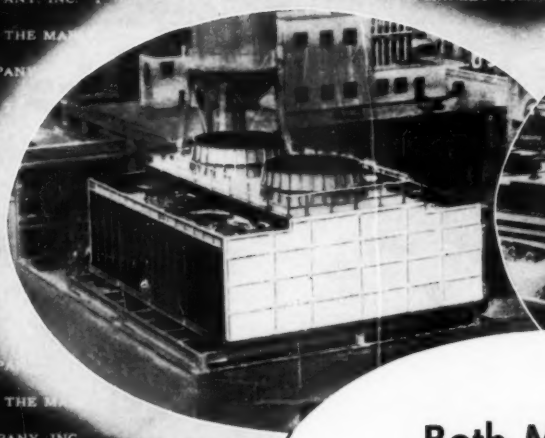
Why WORTH WELDED STEEL PIPE?

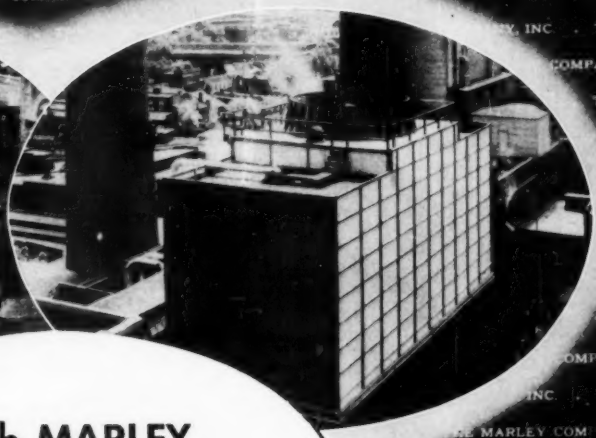
Good pipe from *controlled* plate is the answer. From the combining of the chemical elements . . . through the open hearth and the rolling mills, painstaking supervision produces "Fully Deoxidized" Steel Plate of uniform quality. This "homogeneous" plate, when formed into Pipe, has unusual bending and welding properties that enable you to "fit-it-up" and "lay-it-down" faster.

Worth "Fully Deoxidized" Steel Pipe—easier to bend and weld—is available in 40′ lengths in 24″, 26″, 30″ and 36″ O.D. Deliveries are reasonably prompt. Write for detailed information.

FLANGED AND DISHED HEADS • CARBON AND STAINLESS-CLAD STEEL PLATES

WORTH STEEL COMPANY • Claymont, Delaware





Both MARLEY Double-Flows

They're Different! Why?

No two water cooling requirements are exactly alike!

Water temperatures and gpm vary, horsepower requirements differ, space limitations are dissimilar, wet bulb conditions are not the same.

Recognizing this fact, Marley Double-Flow cooling towers are available in a wide range of sizes so you can fit a standard Double-Flow to your job . . . not the job to the cooling tower.

For example, the Marley Double-Flow on the left is used for air-conditioning service in a large department store in a climate where temperatures vary widely. Here it was desired to have a tower with four cooling cells and two fans to provide utmost flexibility . . . one, two, three or four cooling cells operating independently. A low silhouette was needed to save conflict with the city skyline. And, a broad-based tower allowed the weight to be distributed over a wide area. In order to meet a building code, the California redwood tower was cased with asbestos-board.

The Marley Double-Flow on the right was selected for one of the world's largest breweries. In this case, a tower was needed to cool a large gpm of water. Because of space limitations, the tower was erected on a high, elevated grillage with the area beneath the tower available for material storage. The cold water basin of the Double-Flow tower became the roof of the storage area.

These are only two of the hundreds of case histories in Marley files on operating Double-Flows that show how standard, low priced Double-Flow towers are expertly applied by trained application engineers.

Although sizes vary, all Marley Double-Flow cooling towers have many exclusive features . . . open distribution system, easy inspection and regulation, two independent cooling cells for each fan, nail-less filling, more drift eliminator area and Marley mechanical equipment. And, all Double-Flows are backed by the Marley guarantee.

Modern automatic machines and skilled craftsmen in three plants, enable Marley to furnish accurately fabricated towers to fit your job at a savings to you. If you have a water cooling problem, let Marley "know-how", starting in the blue-print stage, help you get MORE FOR YOUR MONEY by "custom tailoring" an economical, standard Marley Double-Flow to meet your specific needs.

MAIL THIS COUPON TODAY

The Marley Company, Inc., Kansas City 15, Kansas

- ☐ I'd like to know more about DOUBLE-FLOW Cooling Towers. Please send FREE Bulletin DF-50.
- ☐ Have Engineer call, at no obligation to us, to discuss our water cooling needs.

OG-5

Name _____ Title _____

Company Name _____

Address _____

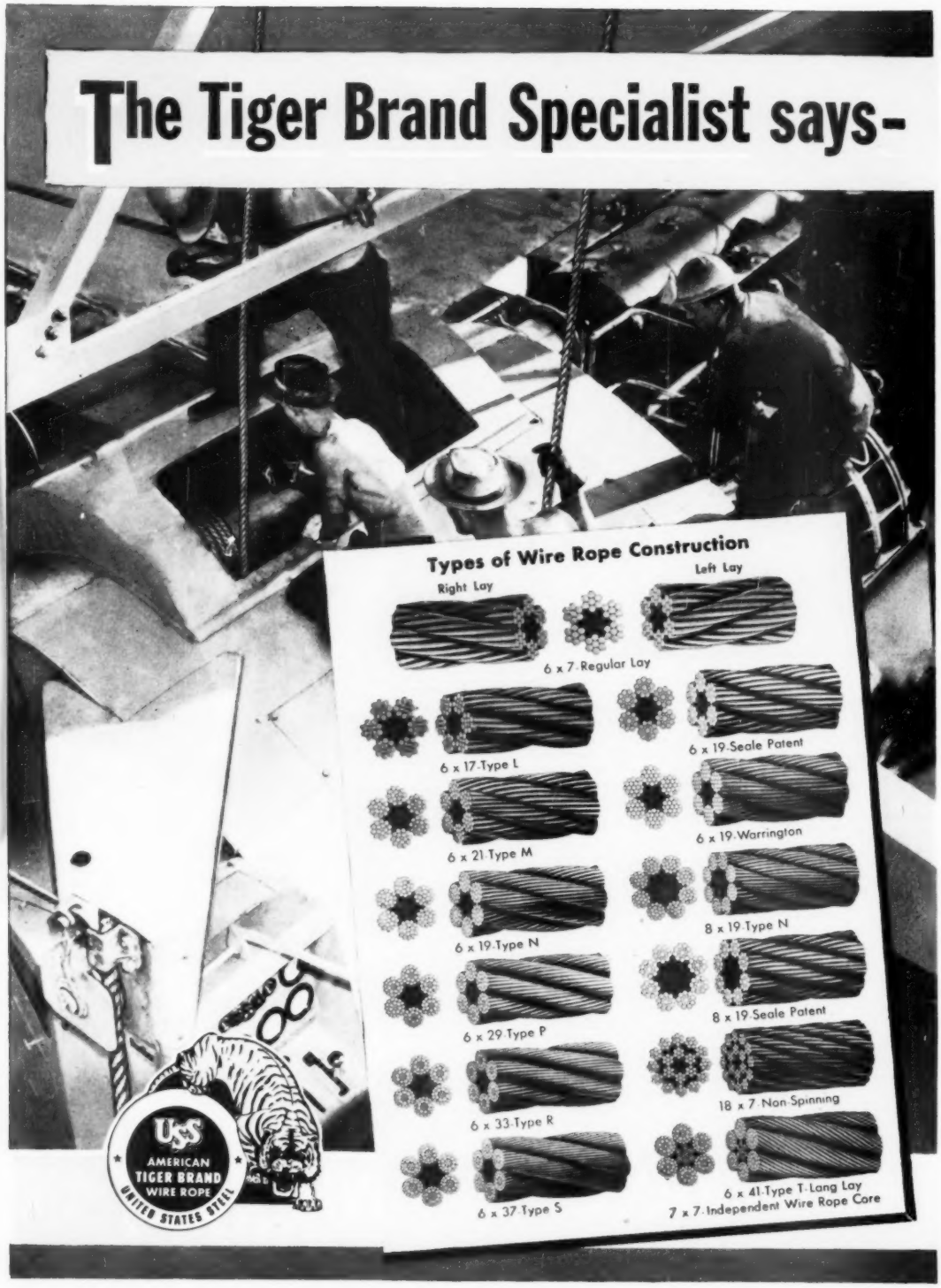
City _____ Zone _____ State _____

MARLEY

Double-Flow Vairflo DriCooler Natural Draft Counter-Flow Aquatower

Spray Nozzles

The Tiger Brand Specialist says-



"Here's what you should know about wire rope —and how to select, use and care for it."

THE three most important qualities that wire rope must possess are (1) strength, (2) fatigue resistance, and (3) abrasion resistance. Whether the rope is used on hoists, cranes, excavators, conveyors, loaders or unloaders, these properties are required in varying degrees depending on serivce requirements.

STRENGTH—This is determined by size, grade, and construction. Wire for wire rope can be made in any desired tensile strength ranging from iron grade at approximately 100,000 lbs. per sq. in. to improved plow steel grade at approximately 250,000 lbs. per sq. in. The knack of making Tiger Brand Ropes with uniform strength throughout shows the skill of the wire rope manufacturer.

FATIGUE RESISTANCE—The ability to make wire that will stand thousands of bends over drums and sheaves without breaking is no small accomplishment. The wire must be made with just the right amount of toughness and ductility. Tiger Brand Wire Rope is made from wire especially fabricated for wire rope use. Ropes composed of a large number of small wires will have higher fatigue resistance than those made with a smaller number of large wires.

ABRASION RESISTANCE—This is determined by the size and chemistry of the wires, especially the outer wires as they are exposed to the most wear. Obviously, the larger the wire size the greater the resistance to abrasion. Furthermore, the high strength steels are better able to withstand wear because of a greater carbon content. This means that improved plow steel ropes would have the highest abrasion resistance.

Getting the right balance

Individually, the properties of strength, fatigue resistance, and abrasion resistance are not difficult to obtain . . . but in wire rope making, it is impossible to accent one property without detriment to the other two. That's why the skill and experience of the men who make Tiger Brand Wire Rope are so important. Satisfactory performance demands that running ropes possess all three properties and therefore it is necessary to obtain an effective balance which meets the requirements of your particular job.

How to get longer wire rope life

Don't overload the rope.

Don't subject the rope to sudden impact loads.

Don't use undersize sheaves and drums—this is the commonest cause of fatigue breaks.

If vibration is present, make regular cuts from the end of the rope so as to change the dampened section.

Keep groove diameters proper size so as to avoid pinching of rope.

Avoid flange wear as a result of bad sheave alignment.

If grooves become fluted, it is usually a sign that the sheaves should be replaced with a harder material.

Lubricate regularly. Wire rope is a machine and requires adequate lubrication. It must also be protected from corrosion to retain strength.

Avoid kinking, improperly attached fittings, and uneven drum winding.

Make use of the Tiger Brand Wire Rope Specialist

It is very much to your advantage and to ours to maintain good operating practices. Call in the Tiger Brand Specialist at regular intervals and have him give you a FREE Check-up. He is thoroughly experienced in proper wire rope application.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Send for FREE BOOKLET

American Steel & Wire Company
Rockefeller Building, Dept. P-50
Cleveland 13, Ohio

Please send me a copy of your catalog, "American Tiger Brand Wire Lines for Oil, Gas and Water Wells."

Name.....

Company.....

Position.....

Address.....

City.....State.....

AMERICAN TIGER BRAND WIRE ROPE

Excellay Preformed

UNITED STATES STEEL

These records are typical of every day performance with

Pelton

LONG STROKE Hydraulic Pumping Jack

CASE No. 1
PELTON
Model 312-9-30C-P
Pump Bore: 1½"
Pump Setting: 11,140 ft.
Surface Stroke: 30 ft.
Production: 300 B/D
Previous Equipment: Gas Lift

CASE No. 2
PELTON
Model 412-9-20A
Pump Bore: 2¼"
Pump Setting: 8,100 ft.
Surface Stroke: 20 ft.
Production: 430 B/D
Previous Equipment: Subsurface Hydraulic Unit

CASE No. 3
PELTON
Model 512-8-30C-P
Pump Bore: 2¼"
Pump Setting: 6,800 ft.
Surface Stroke: 30 ft.
Production: 825 B/D
Previous Equipment: 108" Beam Unit

CASE No. 4
PELTON
Model 412-8-20A
Pump Bore: 2¾"
Pump Setting: 3,900 ft.
Surface Stroke: 20 ft.
Production: 1050 B/D
Previous Equipment: 74" Beam Unit

* More Oil at Less Cost
* Fewer Rod Partings
* 9-12 Months Pay Out

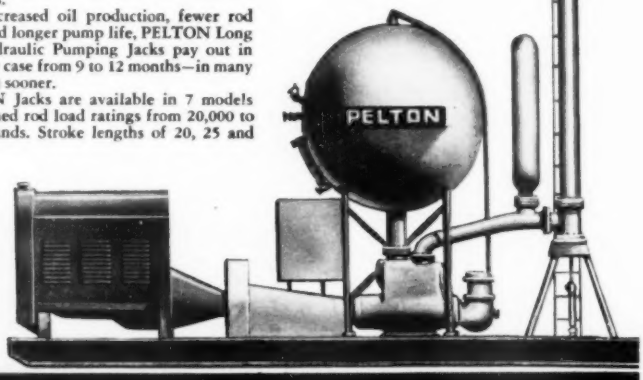
Here are actual examples of PELTON Long Stroke Hydraulic Pumping Jack performance in California and Mid-Continent fields.

Long stroke pumping produces more oil than the short stroke method because pumps with larger displacement can be operated at increased plunger travel. Compared to beam pumping, the same fluid weight can be lifted with less rod stress or more oil can be lifted at the same rod stress. Sucker rod stress loads up to 40,000 p.s.i. are practical with long constant velocity strokes and soft rod reversals. Shock loads, whipping and other rod fatigue and stress increasing forces are reduced to a safe working range.

The use of a PELTON assures longer life for sucker rods and bottom-hole equipment. A decrease in rod partings of 85% and a reduction in pump jobs of 75% are typical of every day performance when PELTON replaces short stroke units.

With increased oil production, fewer rod partings and longer pump life, PELTON Long Stroke Hydraulic Pumping Jacks pay out in the average case from 9 to 12 months—in many cases, much sooner.

PELTON Jacks are available in 7 models with polished rod load ratings from 20,000 to 40,000 pounds. Stroke lengths of 20, 25 and 30 feet.



Send for Application Data Sheet
Complete recommendations furnished upon request without obligation.

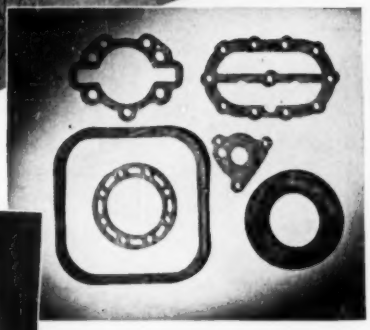
SEE OUR CATALOG IN THE COMPOSITE CATALOG

PELTON Long Stroke

THE PELTON WATER WHEEL COMPANY
2447 EAST 54TH STREET • LOS ANGELES 58, CALIFORNIA
DISTRICT OFFICES: LOS ANGELES · SAN FRANCISCO · DALLAS · HOUSTON · NEW YORK CITY · PHILADELPHIA

QUESTION:

Which Garlock gasket sheet is recommended for hot oils, steam or hot gases up to 700° F?



ANSWER:

Garlock 7021

Above: GARLOCK 7021 Compressed Asbestos Sheet. Thicknesses $\frac{1}{64}$" to $\frac{1}{4}$". Sheets 40" x 40" and larger. *Below:* GARLOCK 7022, Gaskets cut from 7021 sheet; all sizes and shapes.

GARLOCK 7021 Compressed Asbestos Sheet Packing is an ideal gasketing material for use against high temperatures and extreme pressures. It is sufficiently compressible to compensate for normal irregularities in flange faces but resistant to plastic flow under heavy bolt loads. Specially recommended for severe oil and steam service. A Garlock representative will call upon request.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

Tulsa, Okla. Houston, Texas Los Angeles, Calif.

GARLOCK

PACKINGS, GASKETS AND OIL SEALS

REPUBLIC Alloy Steels

A REPORT FROM REPUBLIC STEEL'S

METALLURGICAL FILES

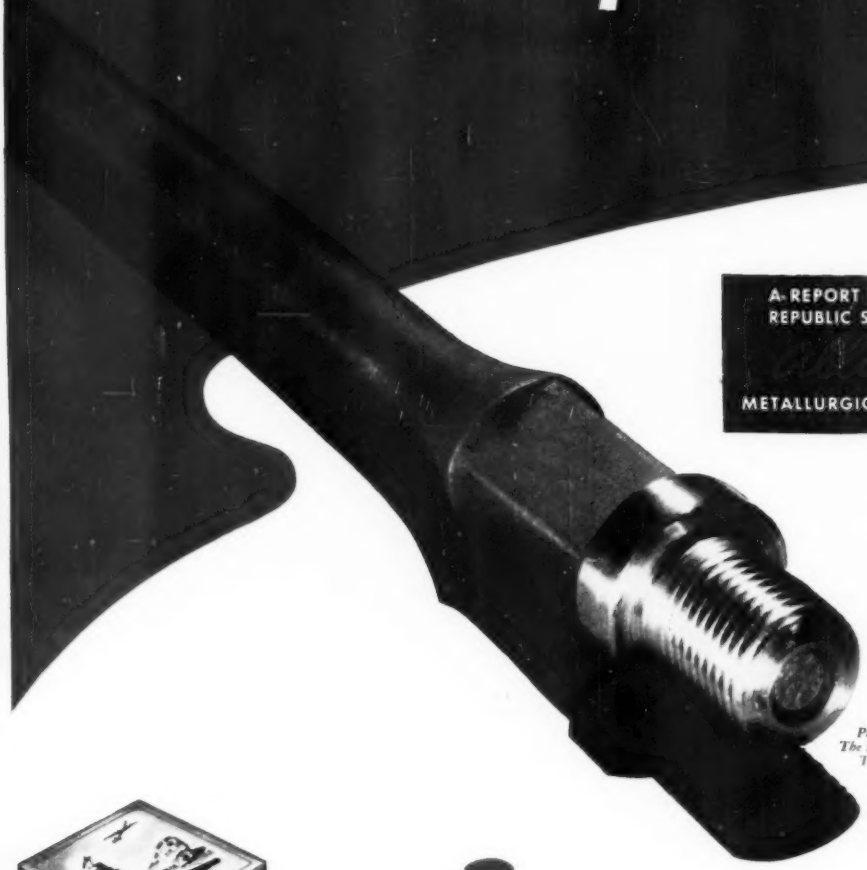


Photo courtesy The S. M. Jones Co., Toledo, Ohio

3 DIMENSION *Metallurgical Service*

. . . combines the extensive experience and coordinated abilities of Republic's Field, Mill and Laboratory Metallurgists with the knowledge and skills of your own engineers. It has helped guide users of Alloy Steels in countless industries to the correct steel and its most efficient usage . . . IT CAN DO THE SAME FOR YOU.

Other Republic Products include Carbon and Stainless Steels — Sheets, Strip, Plates, Pipe, Bars, Wire,

. . . Sucker Rods for Heavy-Duty Deep Well pumping now GUARANTEED to 90,000 p.s.i.—whereas the previous high has been 70,000 p.s.i.—another triumph for "*the right steel in the right place*"

With many wells ranging from 6,000 to 12,000 feet in depth, pumping places a tremendous strain on the sucker rod string entrusted with bringing the oil to the surface. Each slender sucker rod unit—only 25 or 30 feet long and ⅝" to 1" in diameter—must be capable of supporting the multi-ton weight of the entire string . . . must carry the weight of the oil rising to the surface . . . must stand up under the constant whipping and reversing action of pumping.

For more than five years, Republic's field-mill-laboratory metallurgical team has worked with this manufacturer's own metallurgists—to produce a stronger, longer-lasting sucker rod for deep well pumping.

The result? The "right steel in the right place" not only increased yield strength by a phenomenal 30%, but it did more. Coupled with this added strength are great endurance and high fatigue resistance. And because the steel is used in its normalized and tempered condition, there is no sacrifice in needed corrosion-resistance.

This is but one of many important oil field applications in which Republic Alloy Steels and 3-Dimension Metallurgical Service have resulted in improved performance . . . lower production costs . . . higher productivity. What has been accomplished here can reasonably be done in *other* applications, in *other* industries.

Are you using "the right steel"? Why not call on Republic's 3-Dimension Metallurgical Service to work with your own metallurgists toward finding it—and with it, new economies and new profits. Call your nearest Republic representative today.

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

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Pig Iron, Bolts and Nuts, Tubing

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Pipeline Contractors
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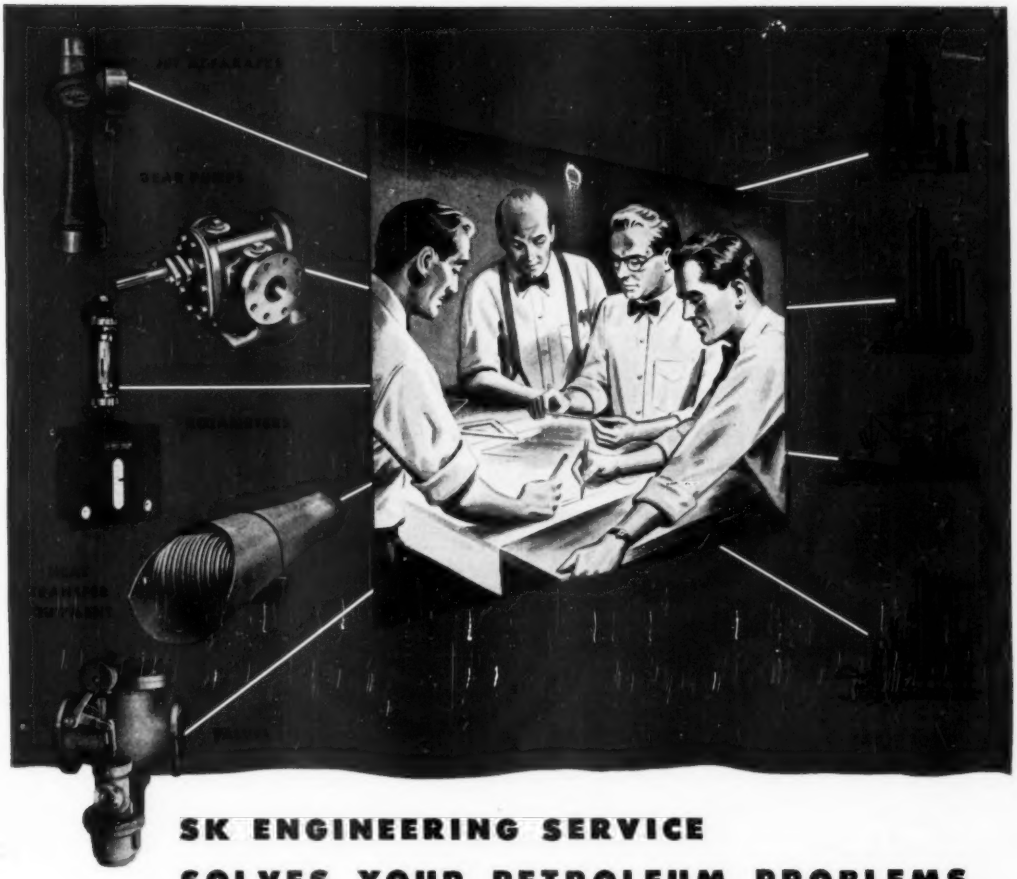
. . . at Your Service



SK ENGINEERING SERVICE SOLVES YOUR PETROLEUM PROBLEMS

The many types of equipment bearing the SK mark are designed and built to render years of outstanding performance. SK Engineers have long been aware of the necessity for engineering each specific application to assure the user of full performance value, economy and satisfaction. That's why SK Engineering Service is maintained for all those faced with problems involving the use of SK products in the producing, gas processing, refining or transporting phases of the industry.

An amazing amount of problem-solving knowledge has been accumulated in our seventy-odd years of engineering and manufacturing equipment for the petroleum industry. Since that knowledge is available for your use, why not use it?

If you're interested in any particular type of product, request a catalog. We will gladly supply it. If you have a problem requiring engineering assistance, our engineers are as close as your phone.

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GRAVER
CONSERVATION AT WORK
for GREAT LAKES PIPE LINE COMPANY
Sioux Falls, S. D., Terminal. Three Graver Expansion Roof Tanks manifolded to 27 Graver cone roof tanks.

A story of a job well done . . .

●Several years ago, Graver built petroleum products tankage systems manifolded with Expansion Roof Tanks for the Great Lakes terminals at Sioux City and Des Moines, Iowa; Watertown and Sioux Falls, S. Dak., and Alexandria, Minn.

So satisfactory was the service of the Graver Expansion Roof Tanks that Great Lakes Pipe Line Co. included Expansion Roof Tanks in the specifications for its $55,000,000 expansion program.

The new Graver installations include five 80,000-barrel Expansion Roof Tanks at Minneapolis, four 55,000-barrel Expansion Roof Tanks at Omaha.

Graver installations at Des Moines (one 40,000-barrel Expansion Roof Tank and four 40,000-barrel cone roof tanks) and at Mankato, Minn. (one 40,000-barrel Expansion Roof Tank and three 40,000-barrel cone roof tanks) will be additions to present manifolded systems. Each of these Expansion Roof Tanks will have a 10-foot lift.

This repeat business speaks for itself—a tribute to Great Lakes' progress and testimony to Graver engineering. Ask for case histories on performance and vapor savings with Graver Expansion Roof Tanks. Write now!

GRAVER

FABRICATED PLATE DIVISION

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA

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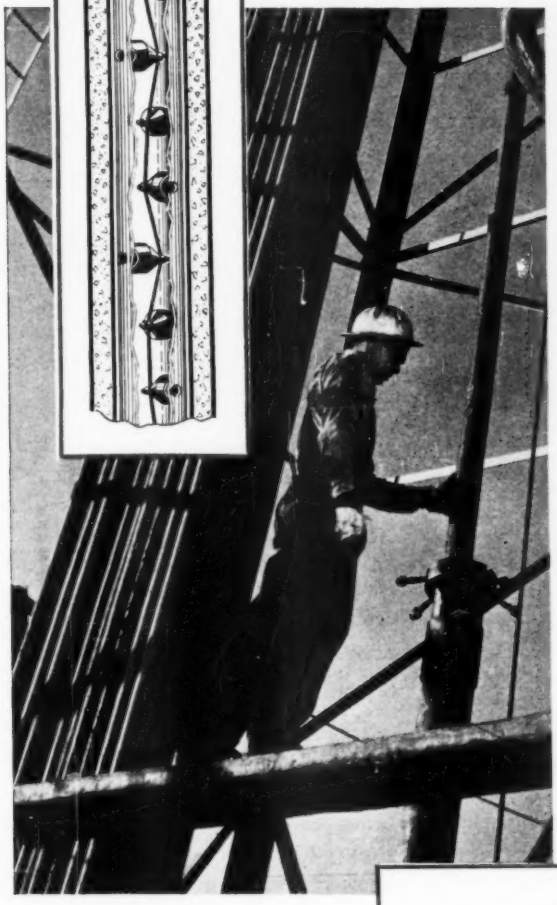
For Maximum Penetration

USE Du Pont Jet Perforators



Discharged carrier is pulled up out of well on typical perforating job.

Cross-section sketch (insert) shows arrangement of Du Pont Jet Perforators in carrier.

Many oil well service companies today rely upon Du Pont Jet Perforators to get important jobs of perforating done quickly, efficiently and economically.

These improved Perforators are precision-made . . . another product of Du Pont explosives research. They contain the strongest explosive available and produce a jet of tremendous penetrating power. They make clean-cut holes through both the casing and the cement sheath, well beyond the range of "mud damage." Each of the several sizes available will readily perforate one, two, or three strings of casing.

The Perforators also save rig time and materially speed up operations because they are preloaded in carriers ready to place in the well upon arrival at the job site. The entire contents of one or more carriers may be fired simultaneously, thus insuring a symmetrical pattern. Well temperatures as high as 350° F. have no affect upon these Perforators.

Because Du Pont Jet Perforators leave a minimum of burr in the casing, no difficulty is experienced in lowering tools through the perforated zone.

For maximum penetration and efficiency in well perforating operations, why not insist that your service company use Du Pont Jet Perforators on your next job? They're regularly specified by many operators both large and small.

E. I. du Pont de Nemours & Co. (Inc.)
Explosive Department,
Wilmington 98, Delaware

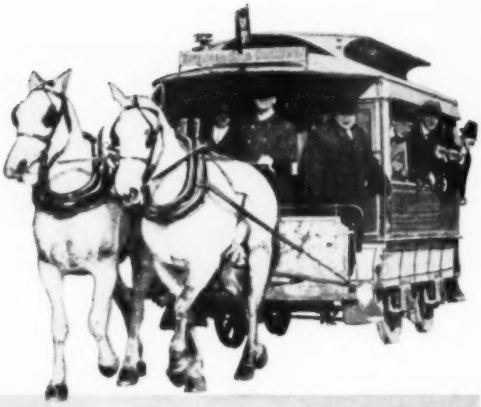
DU PONT EXPLOSIVES

BLASTING SUPPLIES AND ACCESSORIES

DU PONT

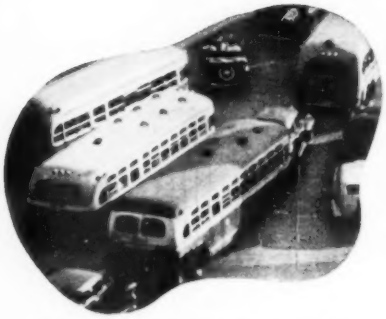
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

The Old Gray Mare *ain't*...



Petroleum Progress helped develop a new, mass method of transportation

Last year the long-haul busses clocked more than 1½ billion miles—all over the U. S. That calls for plenty of power and lots of efficient lubricants to take heavy-duty, fast-moving, highway wear and punishment. This is another outstanding plus for the intensive field of petroleum research.



Every day local busses move millions of workers, school children and others, get them where they are going, in comfort, in safety and on time—thanks to petroleum's efficient power and effective lubrication.

It was the end of the line for the horse-cars when petroleum progress paved the way for the gasoline engine and, later, the Diesel engine. Petroleum fuels and lubricants made possible one of the public's prime movers—the bus. Last year U. S. busses rang up fares for close to ten billion passengers. Many of these were enjoying their short or long hauls in busses operating at low-cost, peak efficiency with Texaco quality fuels and lubricants.

THE TEXAS COMPANY

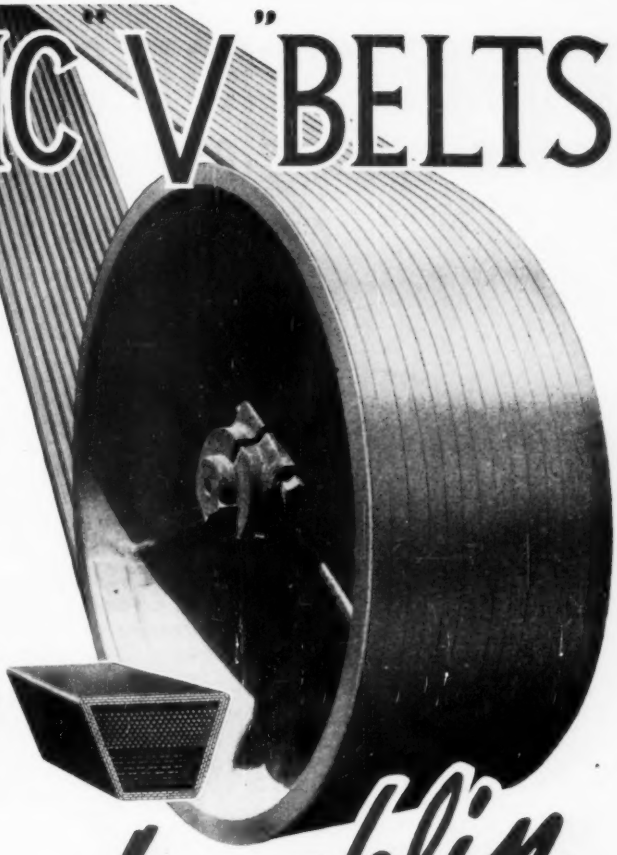
Petroleum Promotes Progress

TEXACO REG. T. M.

REPUBLIC "V" BELTS

- ★ MATCHED LENGTHS
- ★ LOW STRETCH
- ★ UNIFORM GRIP
- ★ LONGER SERVICE
- ★ MORE ECONOMICAL

No question about it—there is a difference in "V" Belts. For details about Republic advantages, and case histories you'll want to know about, contact the nearest of our 78 stores. Incidentally, other Republic Rubber oil country products are also profitable for you to use—and just as conveniently available.



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J&L STEEL

BARRETT* PROTECTIVE PRODUCTS
COVER EVERY PIPE-COATING NEED

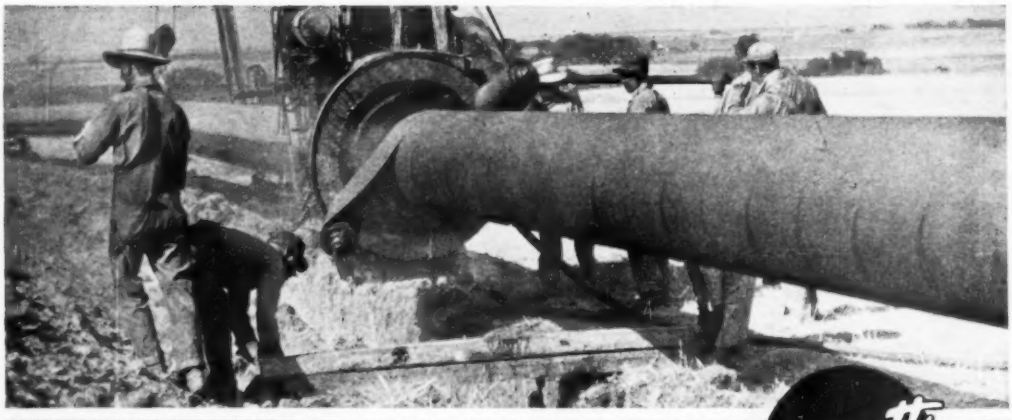
1 **Pipeline Enamel**
2 **Millwrap Enamel**
3 **A.A. Enamel**
4 **Asbestos Felt**
5 **Materials for Special Uses**

BARRETT* ASBESTOS FELT

Barrett* Asbestos Pipeline Felt bonds to the enamel, and shields it from forces which tend to cause enamel penetration, disruption, or displacement. It is flexible enough to withstand curvatures when the coated pipe is handled, and tough enough to prevent shearing at pipe bearing slings.

Asbestos Felt has long been accepted as one of the most durable, most effective, and most economical pipe-wrapping materials known. Barrett coal-tar saturated Asbestos Pipeline Felt is high in the enamel shielding and reinforcing qualities essential to the construction of corrosion-proof pipelines.

This high-quality felt is available in rolls of various widths required by pipeline diameters, and in lengths to suit the different types of coating and wrapping machines.



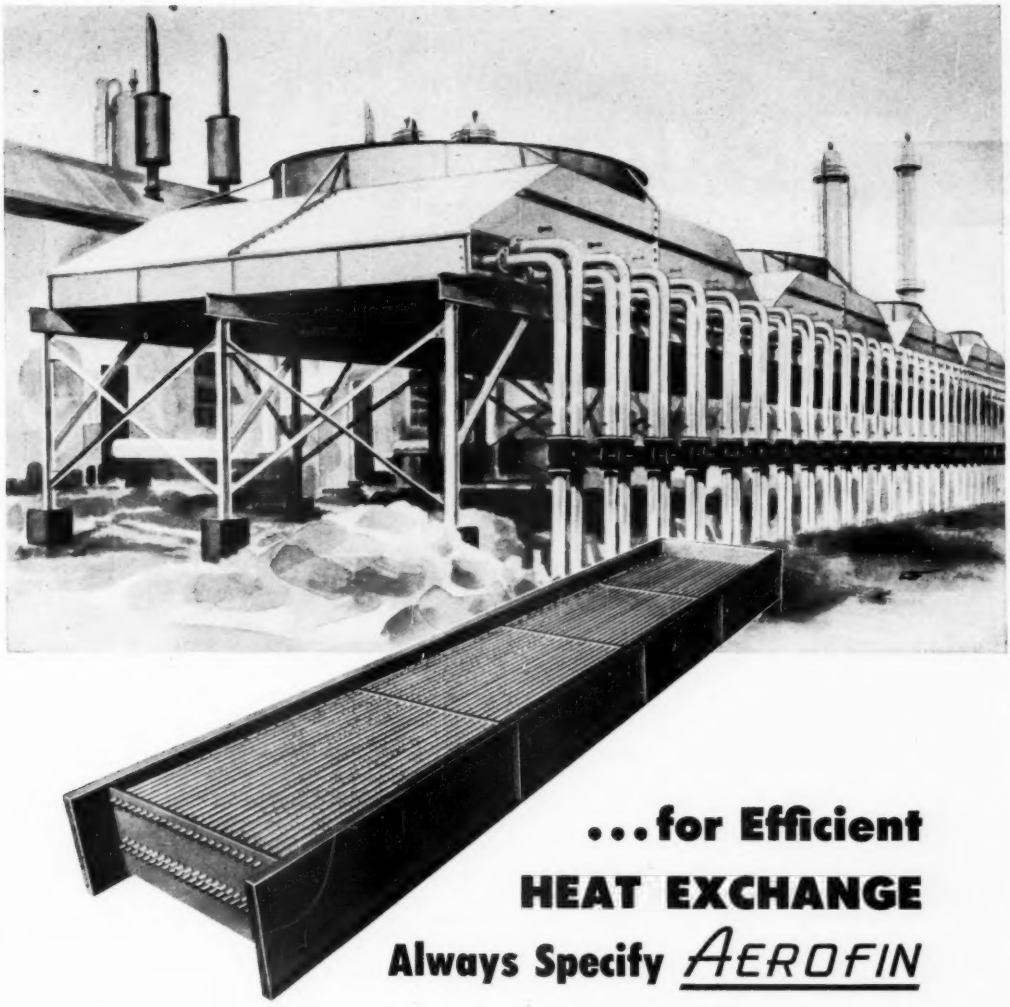
Memo: **FOR CORROSION ENGINEERS**

Barrett coal-tar materials for special uses are all dependable, durable and economical. Eternium* Paint for exposed metal work. CA-50 Heavy-Duty Cold Application Coating for concrete and metal exposed to extremely corrosive conditions. Marine Enamel for ships, barges and off-shore service vessels. Service Cement and Pipeline Fabric for field joints—no torching required. Asbestos Pipeline Felt for soil stress shield. Tank Bottom Compound for sour crude storage. 34 YB Paint for exposure to salt water spray conditions.

Barrett*

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

*Reg. U. S. Pat. Off.



. . . for Efficient HEAT EXCHANGE Always Specify AEROFIN

Aerofin gas-engine jacket-water cooling installation, La Gloria Corporation, Falfurrias, Texas. Designed to cool 334,200 gallons of water per hour from 155° to 145° using 100° ambient air. Heat transfer 27,850,000 BTU/hr. Engineered and built by Hudson Engineering Co.

Whatever the heat-transfer problem — whatever the medium — whatever materials are required for highest efficiency and lowest maintenance costs, you can always rely on Aerofin.

Unequalled experience and production facilities, plus constant research and materials testing, assure the proper construction and design for greatest efficiency and longest service life. *Ask the Aerofin man.*

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Aerofin is sold only by manufacturers of nationally advertised fan system apparatus. List on request.

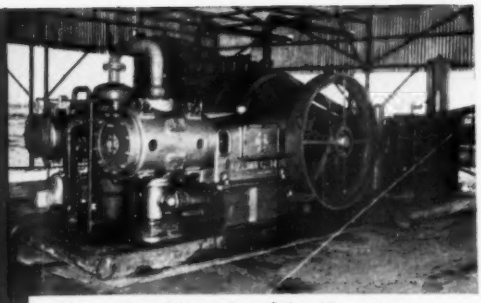
NOW...
GARDNER-DENVER quality increases production in BOOSTER SERVICE RE-PRESSURING AIR-GAS LIFT

Packaged booster compressor units—featuring world-famous Gardner-Denver compressors—are now available in a wide range of capacities and pressure ratings from 5 to 275 h.p.

✓ Check your requirements:

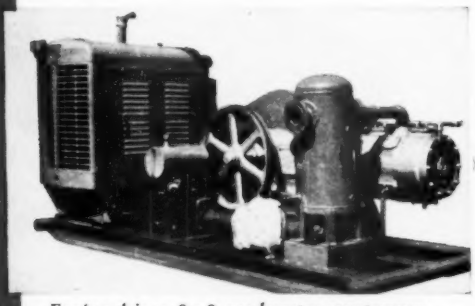
- Portable or stationary units
- Electric motor or gas engine drive
- Single-stage or two-stage units
- Vertical or horizontal compressors

Call your nearest Gardner-Denver office for complete details on any type or size, or write us for further information.

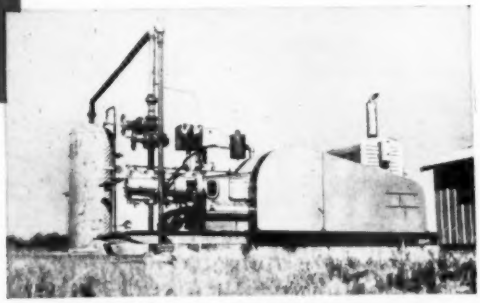


Gas engine driven 12 and 6 x 13 compressor for re-pressuring service.

Engine driven model ABE for re-pressuring or booster service.



Engine driven 8 x 9 gas booster compressor.



Engine driven 5½ x 9 booster compressor.

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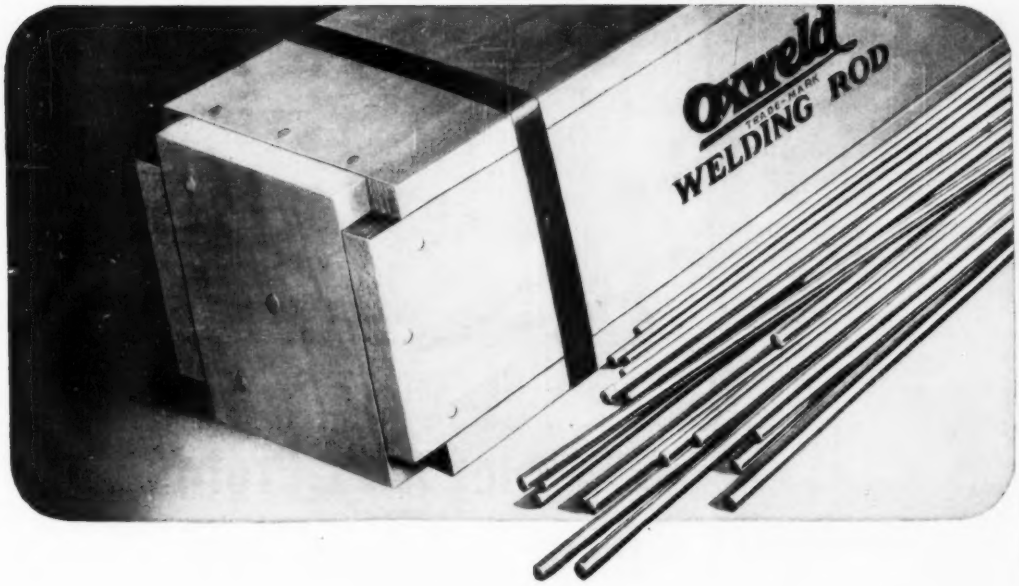

How "OXWELD" Rods Reduce Welding Costs

Trade-Mark

You use less rod per weld, because OXWELD Rods produce high-strength welds with minimum reinforcement. OXWELD No. 1 H. T. Rod, for example, has a tensile strength 11,000 lb. per sq. in. higher than any ordinary steel rod—enough *extra strength* to permit reduction of the amount of weld metal on a job, with substantial saving of gases and labor.

You weld easier and faster—saving both time and gases—because all formulas for OXWELD Rods are worked out to give highest weldability as well as best possible physical properties in finished welds.

You get better welds at lower finishing costs, because welds made with OXWELD Rods are always of uniform high quality, strength, and ductility—easy to machine and finish without excessive labor.

You need fewer types of rods to handle your complete range of welding. Five OXWELD Rods—No. 1 H. T. Steel, No. 7 Drawn Iron, No. 25M Bronze, No. 23 Aluminum, and No. 9 Cast Iron—are sufficient for all average fusion welding, braze-welding, and bronze-surfacing. For the less frequent jobs of specialized nature, there are 9 additional welding rods and 8 hard-facing rods—all available from the same source.

The term "Oxweld" is a registered trade-mark of Union Carbide and Carbon Corporation.

Look for the **Oxweld** Trade-Mark on the rod or on the box

THE LINDE AIR PRODUCTS COMPANY

Unit of Union Carbide and Carbon Corporation

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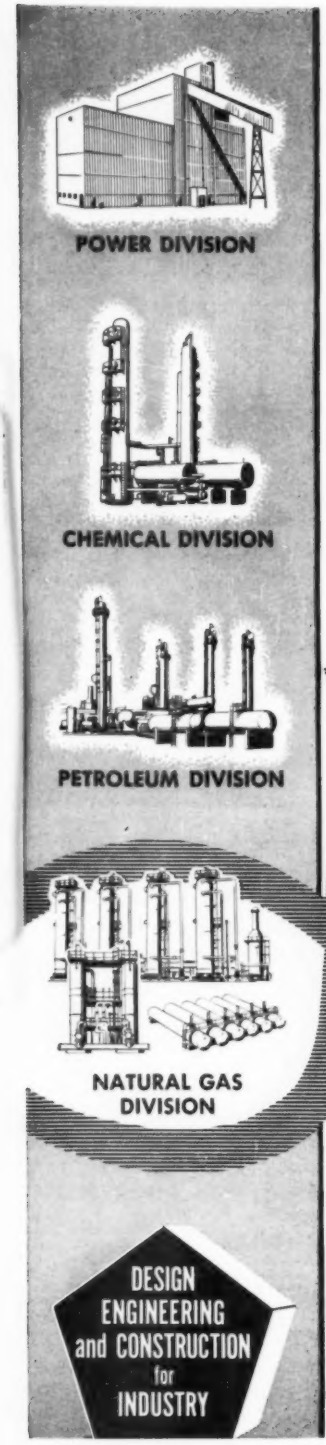

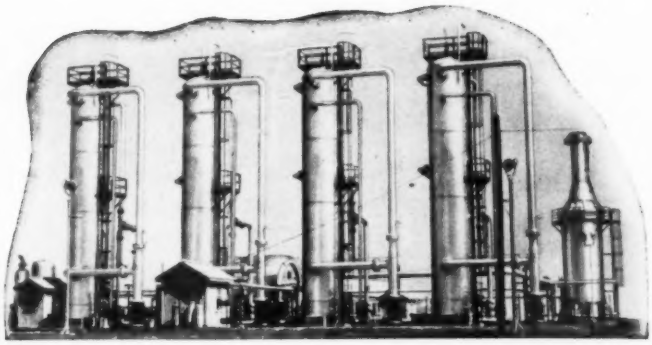

Natural Gasoline Dehydration Plant with a daily capacity of 300,000,000 SCF at 1000 psig, recently designed and engineered by Pritchard.

Industry Profits from Pritchard-Built Plants

For the most modern advancements in design, engineering and construction — to assure plants that produce higher profits and give trouble-free operation—consult J. F. Pritchard & Co. Pritchard-built plants are well known for their operational efficiency and quality of production.

J. F. Pritchard & Co. offers complete service from Analysis of Requirements through Economic Studies, Design, Processing, Engineering, Purchasing, Field Construction, Guarantees and full "On Stream" Operating Tests. Firm prices quoted on a "Turnkey" basis.

Take advantage of Pritchard's years of experience in the Gas Engineering field . . . Let J. F. Pritchard & Co. build profit-producing plants for you.

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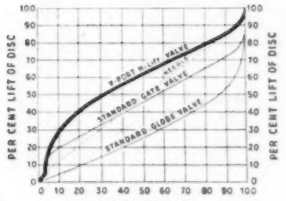
PER CENT LIFT OF DISC
PER CENT FLOW
V-PORT HI-LIFT VALVE
STANDARD GATE VALVE
STANDARD GLOBE VALVE
0 10 20 30 40 50 60 70 80 90 100

Flow characteristics of the Honeywell Hi-Lift Hand Control Valve far surpass those of conventional designs . . . offer favorable comparison to the precision of such diaphragm operated control valves as the Honeywell Series 700.

WORLD'S LARGEST ORGANIZATION FOR ADVANCED INSTRUMENTATION AND CONTROL
COMMERCIAL • RESIDENTIAL • INDUSTRIAL

THE Honeywell Hi-Lift Hand Control Valve is ideal for use where automatic regulation is not necessary or advisable. Designed to afford micrometer adjustment of flow, it contains an indicating scale to show percentage of stem travel to 1% and an inner valve capable of responding to such close correction. Inset illustration shows the simple and easy-to-read scale and the curve at left portrays the superior flow characteristics of the Hi-Lift over conventional valve designs.

The Honeywell Hi-Lift is available with v-port or parabolic discs . . . in sizes from ¼" to 12" . . . straight through or angle . . . for pressures up to 600 lbs. . . . with body of Bronze, High-Tensile Iron or Cast Steel . . . and with Bronze or Stainless Steel trim. Available, too, with electric motor for remote control applications.

Call in your local Honeywell engineer for detailed information about the Hi-Lift and such other Honeywell Process Control Specialties as: Transfer Valves, Liquid Level Devices, Cylindrical Plug Valves and the Honeywell Space-Saving Bypass.

Write, today, for a copy of Bulletin #242-1!

MINNEAPOLIS-HONEYWELL REGULATOR CO.
INDUSTRIAL DIVISION
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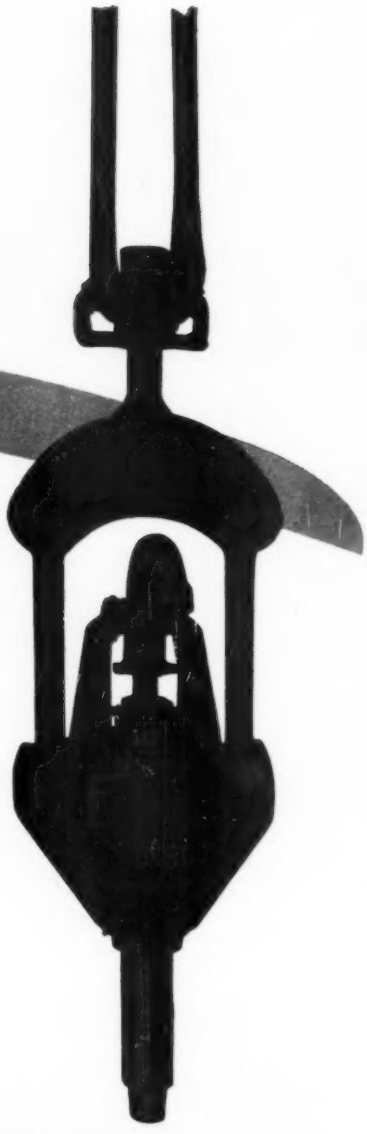
Offices in 77 principal cities of the United States, Canada and throughout the world

Honeywell
DIAPHRAGM VALVES
AND PROCESS CONTROL SPECIALTIES

RATED BY ITS LIFE LINE



Life expectancy graphs, plus simulated field tests in our shop, assure you that "Ideal" Swivel bearings will adequately handle your drilling loads.

Specially-developed steels are used in the main bearing of every "Ideal" Swivel. And for a double-check, these steel parts are magna-fluxed to make sure that the bearing will stand heavy loads at high rotating speeds.

There's an "Ideal" Rotary Swivel to handle every drilling requirement . . . shallow, medium, deep, deepest. All are shop-tested under various loads and speeds to assure you of long, trouble-free service in the field.

Write for bulletins describing "Ideal" Swivels for your drilling needs.

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NATIONAL BLUE PRODUCTS

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SPANG PIPE . . . SUPERIOR ENGINES

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CANADA: THE NATIONAL SUPPLY COMPANY, LIMITED, ROOM 202, ALBERTA BLOCK, CALGARY ALBERTA.

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RADIO COMMUNICATION SYSTEMS

Spanning terrain where land lines can't go! *Spurning storm, flood, and fire,* MOTOROLA MICROWAVE is taking cross-country assignments in stride.

With full automatic standby, MOTOROLA MICROWAVE is in service through all conditions, simultaneously handling scores of messages and *functions—unattended*—providing full facilities for party lines, private circuits, wire line extensions, at a substantial saving in cost over existing communication facilities.

ALSO CAPABLE OF SIMULTANEOUSLY HANDLING
IN NUMEROUS COMBINATIONS:
10 VOICE CIRCUITS
180 TELETYPE CIRCUITS
400 REMOTE SUPERVISORY CONTROL FUNCTIONS

Motorola — *THE SPECIALISTS IN Radio Communication Systems for Industry*
World Leader in 2-Way Mobile Radio

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COMMUNICATIONS & ELECTRONICS DIVISION,
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DETAILS PLEASE ☐ MICROWAVE ☐ SUPERVISORY CONTROL
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ADDRESS ..... ☐ FM 2-WAY MOBILE SYSTEMS
CITY ..... ☐ TELEMETERING

YOU CAN BE **SURE**.. IF IT'S -

Westinghouse

"DUST STORM". Abrasive dusts sprayed on the Type E, while operating at full speed, for extended periods, fail to impair operation. In these tests, none of the abrasive entered the bearing housing . . . governing and overspeed-trip mechanisms continued to operate freely.

Defies dust and dirt

The Type E Turbine is built for tough service. You can depend on this new general-purpose steam drive for the kind of service you want . . . *whenever* and *wherever* you want it. Whether you use the Type E for continuous or stand-by duty, you'll get smooth, reliable power.

Prolonged exposure to abrasive dusts or accumulations of sludge fails to more than dirty up the outside casing. Bearing seals are positive . . . keep oil in and filth out. No foreign matter can enter bearings or cylinder. There are no close-sliding fits to become jammed. Corrosion is avoided by liberal use of corrosion- and erosion-resisting materials throughout interior and exterior mechanisms. The governor-control linkage is always free to move, even when heavily covered with dust and dirt.

Exposure protection is but one of the important features of Type E Turbines. Wrapped up in one *standard* unit are the best features of previous Westinghouse mechanical drives, plus refinements and new developments that add up to greater economy and dependability. Sizes are available from 5 to 1,500 hp.

We invite your comparison . . . on *any* count. Get the facts from your nearby Westinghouse office, or write for 20-page booklet B-3896. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-50500

Westinghouse

TYPE E

Turbines

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The sooner you get these hard-working beads in your dehydrator, the sooner you'll get greater efficiency . . .

This new Sovabead team is ready now to give you all the benefits of a vastly improved desiccant for natural gas dehydrators.

Why wait until your present drying agent is completely inactive before you change?

Here's what you can get immediately:

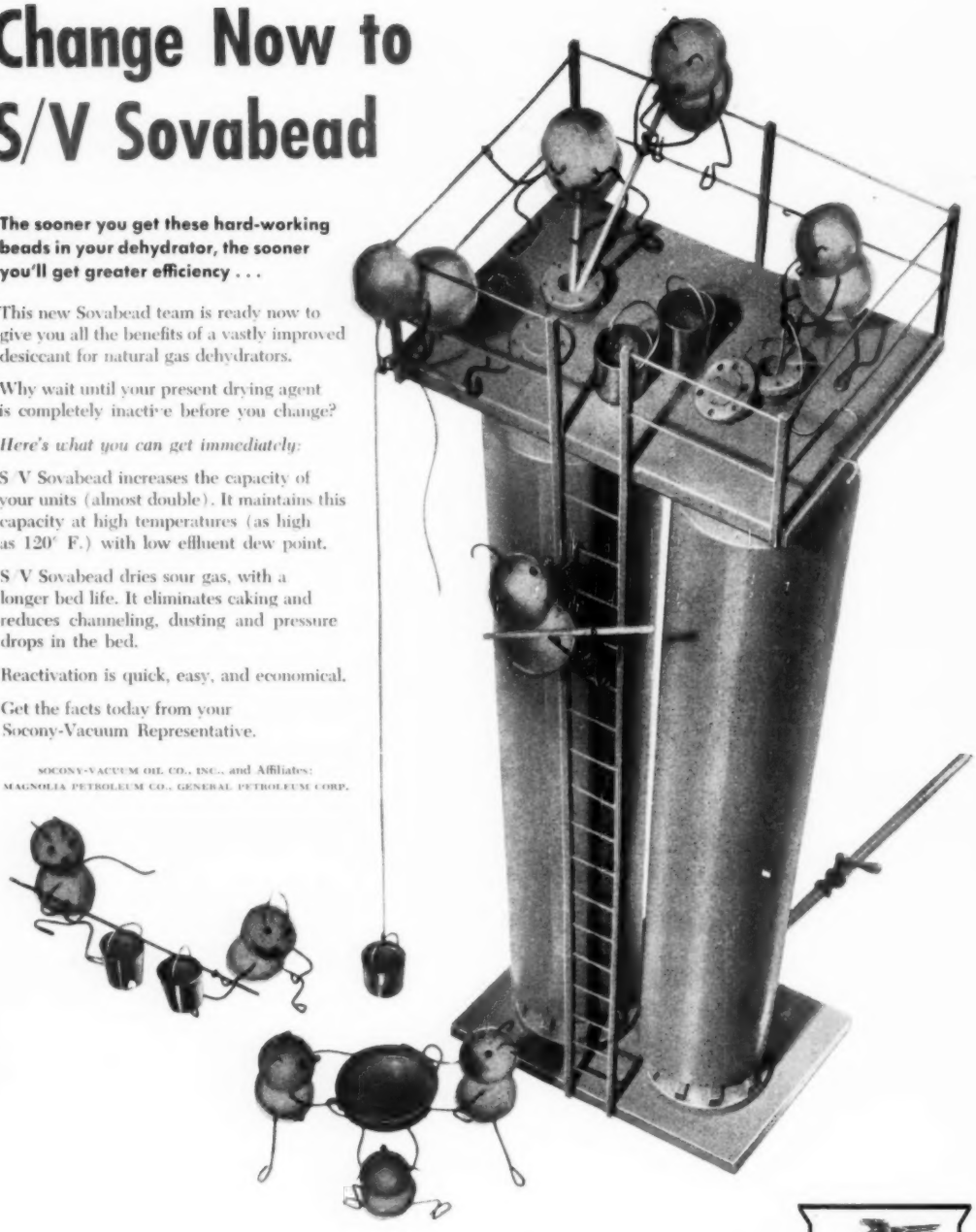
S/V Sovabead increases the capacity of your units (almost double). It maintains this capacity at high temperatures (as high as 120° F.) with low effluent dew point.

S/V Sovabead dries sour gas, with a longer bed life. It eliminates caking and reduces channeling, dusting and pressure drops in the bed.

Reactivation is quick, easy, and economical.

Get the facts today from your Socony-Vacuum Representative.

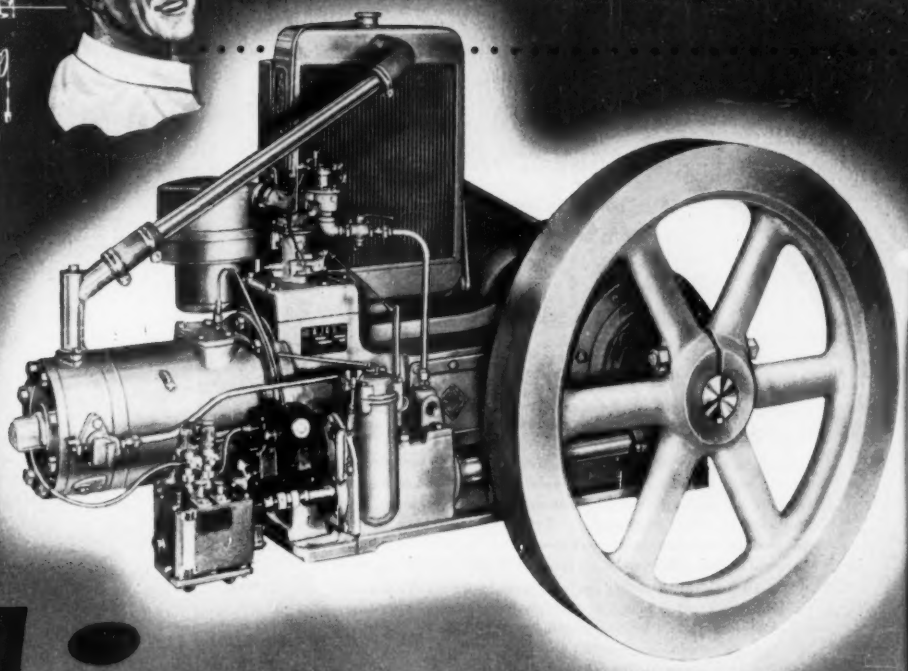
SOCONY-VACUUM OIL CO., INC., and Affiliates:
MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.



Socony-Vacuum Process Products

Process Products
SOCONY VACUUM

"YOUR kind of engine
for YOUR kind of jobs!"



Ajax GAS and OIL ENGINES

... designed and built

First and Foremost FOR OILFIELD SERVICE!

AJAX Engines are *natural-born* performers on oil country jobs because Ajax builds no other kind. Every specification, every material, every characteristic of our engines exist solely to serve the oil industry's requirements. — *Ask your supply man for the details!*

ENGINE BUILDERS
for the
Oil
Industry
Since 1877

AJAX IRON WORKS
CORRY, PENNSYLVANIA

Oil Field Distributors: THE NATIONAL SUPPLY CO., TOLEDO, OHIO
R. B. MOORE SUPPLY CO., INC., BOLIVAR, N. Y. · BETHLEHEM SUPPLY CO., TULSA, OKLA.

PITTSBURGH
ROTOCYCLE
METERS . . .
Pipe Line • Bulk Plant • Tank Truck
Keep
the Sure
in Measurement!
You can be sure with Rotocycle meters . . . sure to measure all the through put . . . sure to save . . . sure to gain. You see Rotocycle meters alone operate in a continuous series of revolving cycles. There are no valves or pistons to obstruct flow; no back and forth movements to cause wear. Rotation is smooth, effortless. Performance of Pittsburgh Rotocycles is protected by ball bearing mounts.
Whatever your metering requirements, there is a Pittsburgh Rotocycle in the right size and type to do the job—speedily, accurately and at lowest cost per gallon measured.
Write for literature.
Model B-2 Rotocycle meters measuring gasoline and kerosene in natural gasoline plant.
ROCKWELL
Pittsburgh Equitable Meter Division
ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PA.
Atlanta Boston Chicago Columbus Houston Kansas City Los Angeles
New York Pittsburgh San Francisco Seattle Tulsa

- Sizes ½ to 6¾ inches O.D.
- Wall Thickness .083 to 1.000 inches.
- Analyses—To Meet Conditions Where Heat, Corrosion, Pressure and Structural Strength are Involved.

Do the job best with the best tubing for the job—get

GLOBE

ALLOY STEEL TUBES

SEAMLESS—MECHANICAL—PRESSURE

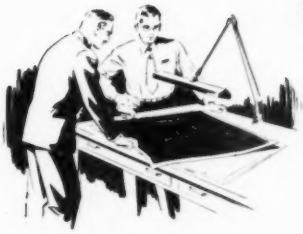
TYPICAL ANALYSES:

- Carbon Moly
- 1¼% Chrome ½% Moly .50/1.00
- 1¾% Chrome .60/.80 Moly
- 2% Chrome ½% Moly
- 2¼% Chrome .90/1.00% Moly
- 4/6% Chrome ½% Moly
- 6-8% Chrome ½% Moly
- 7-9% Chrome ½% Moly
- SAE 1335
- SAE 2300
- SAE 2512
- SAE 4130; SAE 4140
- SAE 4615
- SAE 8615, 8617 Fine Grain
- SAE 8620; 8630; 8635; 8640
- 5% Ni.
- 9% Ni.

TYPICAL APPLICATIONS:

- Superheat Tubes
- Pressure Tubes
- Still Tubes
- Mechanical Tubes
- Condenser Tubes
- Barrel Tubes
- Pump Barrels — Oil Well
- Evaporator Tubes
- Aircraft Tubes
- Propellers
- Rollers for Transmission Chains
- Oil Well Tubing

GLOBE TUBES



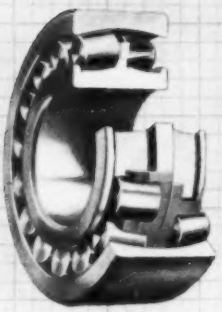
Globe engineers gladly give you the benefit of specialized knowledge and experience on the application of steel tubing in a wide range of services — mechanical — pressure — corrosion resistant.

GLOBE STEEL TUBES CO., Milwaukee 4, Wis.

Chicago - Minneapolis - Cleveland - Detroit - New York - Philadelphia St. Louis - Tulsa - Houston - Denver - San Francisco - Glendale, Calif.

Producers of Globe Seamless Stainless Steel Tubes — Gloweld Welded Stainless Steel Tubes — Carbon-Alloy-Seamless Steel Tubes — Globeiron Seamless High Purity Ingot Iron Tubes — Globe Welding Fittings.

rigged for action...



TORRINGTON SPHERICAL ROLLER BEARINGS

The Cardwell Trailerig is built light and rugged for fast moves, quick rig-up, and heavy-duty service. Torrington Spherical Roller Bearings on the main drum shaft and gear shafts help keep it "rigged for action."

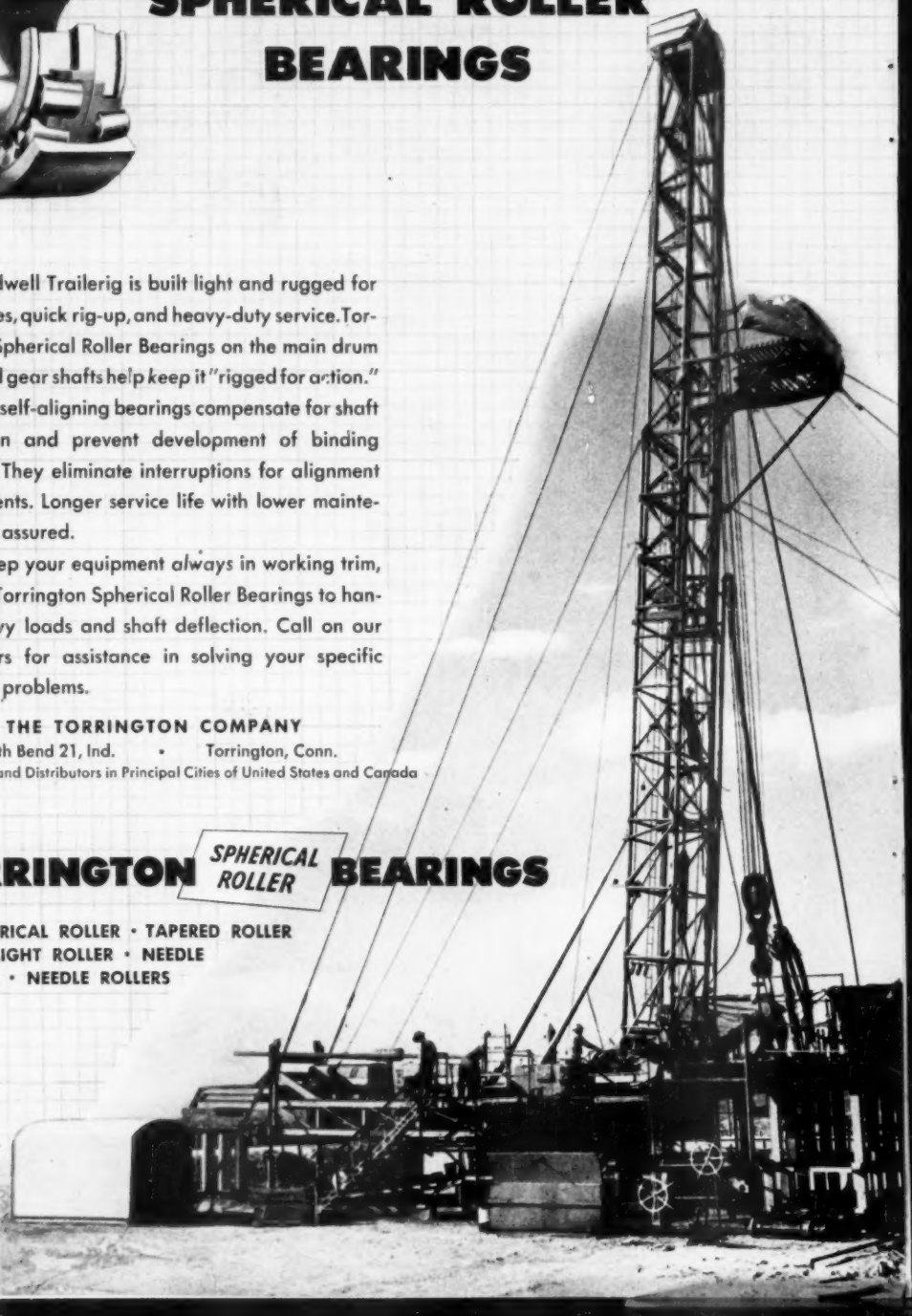
These self-aligning bearings compensate for shaft deflection and prevent development of binding stresses. They eliminate interruptions for alignment adjustments. Longer service life with lower maintenance is assured.

To keep your equipment *always* in working trim, specify Torrington Spherical Roller Bearings to handle heavy loads and shaft deflection. Call on our engineers for assistance in solving your specific bearing problems.

THE TORRINGTON COMPANY
South Bend 21, Ind. • Torrington, Conn.
District Offices and Distributors in Principal Cities of United States and Canada

TORRINGTON *SPHERICAL ROLLER* **BEARINGS**

SPHERICAL ROLLER • TAPERED ROLLER
STRAIGHT ROLLER • NEEDLE
BALL • NEEDLE ROLLERS



COMPLETE "ON-CALL" STOCKS FOR YOUR SPECIALIZED METAL NEEDS

"One-call service... for on-call metals"

Geared to industry's continuous demand for specialized metals, Metal Goods' one-call service is designed to make your metal procurement easier—and more efficient. By having the metals you need "on-call" from your Metal Goods warehouse—*when* you need them—you can eliminate costly metal inventories... save storage space... reduce materials handling... and gain efficiency through simplifying your supply effort.

Metal Goods warehouses are strategically located to serve you quickly and dependably. Sheets, Plates, Tubes, Bars, Fittings and Accessories of... **STAINLESS STEELS ALUMINUM • BRASS • COPPER • MONEL* • NICKEL* • INCONEL***

Plus... complete stocks of Condenser and Heat Exchanger Tubes... Admiralty... "Alclad" Aluminum... 70/30 Super-Nickel, Monel.

Tube Sheets... Naval Brass... Muntz Metal

Fittings and Accessories

Consult your Metal Goods metallurgical specialist on the proper metal for your application.

**Not warehoused in Kansas City or St. Louis*

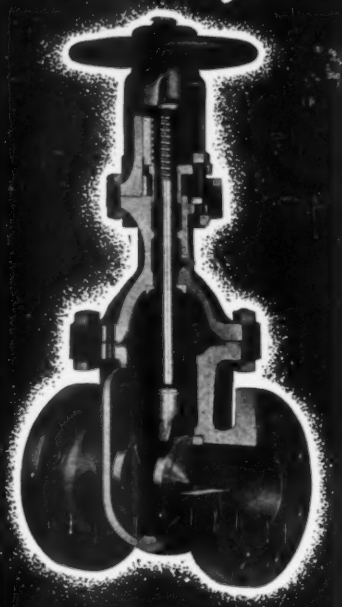
Phone, wire or write your Metal Goods warehouse for your specialized metal needs.

Do you have the "Metalog"? It's a complete stock list and metal manual—Write for it!

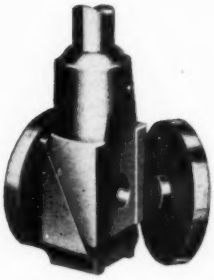
METAL GOODS CORPORATION

OFFICES AND WAREHOUSES: **St. Louis,** 5250 Brown Ave. • **Houston,** 711 Milby St. • **Tulsa,** 302 N. Boston
New Orleans, 432 Julia St. • **Dallas,** 6211 Cedar Springs Rd. • **Denver,** 817 17th St. • **Kansas City,** 1300 Burlington

How Darling features prevent trouble and expense



UNIFORM WEAR DISTRIBUTION



A LARGE percentage of valve leaks, lost time, expense, can be blamed on uneven wear—the uneven wear caused by repeatedly exposing the same disc and seat areas to concentrated pressure, fluid flow, and resultant galling from operation.

For years such leaks were considered the result of normal, expected wear. But the unique design of Darling Double Disc Parallel Seat Gate Valves has proved that uneven wear can be prevented. The two valve discs shown in the cutaway view, and again in the removed inside assembly, are separately and independently hung and free to revolve through their 360°. Valve operation aids the action during the lowering and raising of the disc assembly. The discs never seat twice in the same position and obviously wear is bound to be uniform. This results in tight closure even when the disc faces are worn.

Hundreds of Darling gate valve users have learned by experience that uniform wear distribution results in longer service life and correspondingly lower maintenance cost.

DARLING VALVE & MANUFACTURING CO.
Williamsport 1, Pa.

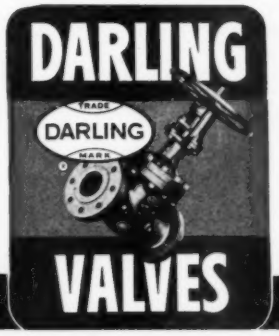
"This advertisement is one of a series showing how the unique Darling Fully Revolving Double Disc Parallel Seat Gate Valves answer the following critical operating problems:

- Positive, easy closing—regardless.
- Automatic adjustment for valve body distortion.
- Elimination of disc-to-seat friction and galling.
- Uniform wear distribution.
- Extreme simplicity.
- Greater service life.
- Simplified maintenance.

CORROSION RESISTANT VALVES

In addition to conventional iron, bronze and steel constructions, Darling specializes in valves for any corrosive fluid: iron body valves with special alloy trim; iron body, rubber lined, with special alloy trim; all bronze; and all special alloy. Darling's 50 years of experience in meeting unusual requirements is always at your service.

Outline your service requirements and get complete *information on Darling Valves of the proper type. Or, send for the complete 300-page Darling Catalog No. 17M. It describes Darling Valves of* all *types for* every *normal or unusual service, and for pressures up to 1500 pounds. It's full of helpful information... Yours for the asking.*



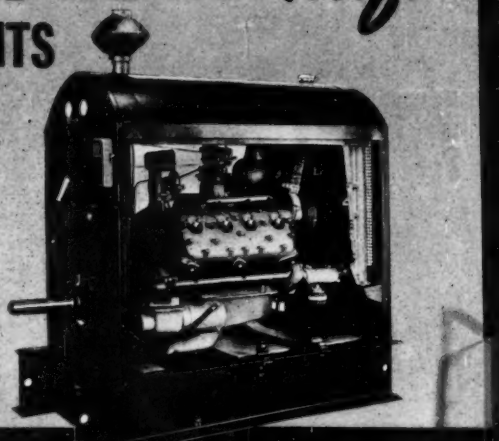
THE VALVE MARK OF QUALITY . . . WATCH FOR IT

Cut POWER COSTS in Half!

with KRW INDUSTRIAL POWER UNITS

● Users everywhere . . . all kinds of power users . . . say without hesitation: "It's the finest and most dependable power plant ever built. It has cut our power costs in half." One reason owners are so enthusiastic is the fact that the heart of every KRW Industrial Power Unit is the great Ford 100 H. P. V-8 Truck Engine . . . blood brother to millions more in service around the world. Thus, every KRW user has available efficient, low-cost Ford Service as well as the Ford Engine and Parts Exchange Plan.

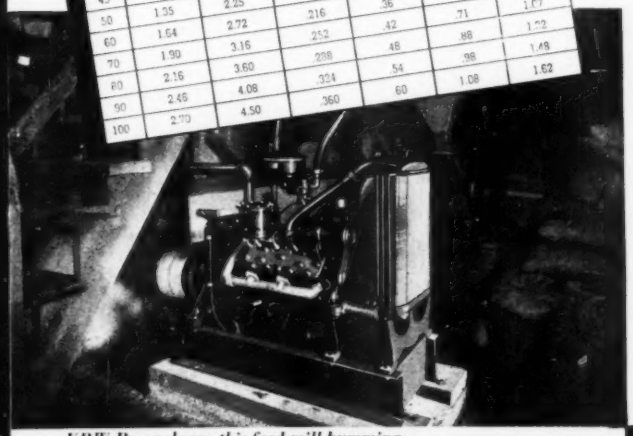
Combined with the V-8 power plant is the KRW 30-year tradition of quality manufacture; of close technical association with Ford, and Ford Dealers everywhere. KRW Conversion Parts are built right, of the right materials by modern precision methods. KRW Power Units operate on either gasoline, natural gas or any "bottled gas." KRW Industrial Power Units have been giving continuous, satisfactory, low-cost service for many years. See your Ford Dealer or mail the coupon.



DRIVEN BY FAMOUS FORD V-8—100 H. P. TRUCK ENGINE—OPERATES ON GASOLINE, NATURAL GAS OR BUTANE . . . EFFECTS TREMENDOUS SAVINGS . . . EVERY FORD DEALER CAN SUPPLY SERVICE AND PARTS.

OPERATING COSTS PER HOUR

Brake Horsepower	ELECTRIC MOTOR 80% EFFICIENCY Cost Per Kilowatt		KRW INDUSTRIAL UNIT OPERATING ON NATURAL GAS Cost Per 1000 Cu. Ft. 1125 B.T.U.		KRW INDUSTRIAL UNIT OPERATING ON GASOLINE Cost Per Gallon (Tax Free)	
	$ .03	$ .05	$ .30	$ .50	$ .10	$ .17
15	.41	.68	.054	.09	.13	.29
20	.54	.90	.072	.12	.25	.38
25	.68	1.13	.09	.15	.30	.45
30	.82	1.36	.108	.18	.34	.51
35	.95	1.58	.126	.21	.39	.59
40	1.08	1.80	.144	.24	.44	.66
45	1.23	2.04	.162	.27	.49	.74
50	1.35	2.25	.18	.30	.54	.81
60	1.64	2.72	.216	.36	.63	.95
70	1.90	3.16	.252	.42	.71	1.07
80	2.16	3.60	.288	.48	.88	1.32
90	2.46	4.08	.324	.54	.98	1.48
100	2.70	4.50	.360	.60	1.08	1.62



KRW Power keeps this feed mill humming.

STUDY THIS CHART IN TERMS OF YOUR INDIVIDUAL NEEDS

The table above shows the comparison of operating costs per hour for (1) Electric Motor, (2) KRW Unit operating on natural gas and (3) KRW Unit operating on gasoline. For dependable, constant-duty power, we recommend an engine speed not to exceed 2250 RPM and that only two thirds of the B. H. P. developed at any given speed should be used. Thus at 2250 RPM the engine develops a maximum of 64 B. H. P. on Gasoline and 55 B. H. P. on Natural Gas. This is usable Horsepower, available for short periods only. Two thirds of this or the constant duty power would be 43 B. H. P. and 36 B. H. P. with Gasoline and Natural Gas respectively. By using only two thirds of the maximum available Horsepower, reserve power is maintained for variations in fuel, lubricating oils, adjustments, ignition and climatic conditions. (There is a 3 to 5 per cent power loss for each 1000 feet of altitude.)

For highest efficiency, long engine life and economy, an engine speed of 1800 RPM has proven most satisfactory. Ford V-8 Engines are so highly developed and perfectly balanced, that an operating speed of 1800 RPM is recommended regardless of the Horsepower to be used.

See your Ford Dealer or Write...

K·R·WILSON

215 MAIN ST. · BUFFALO 3, N. Y.

K. R. Wilson, 215 Main St., Buffalo 3, N. Y. 33

Please send me information and prices on KRW INDUSTRIAL POWER UNITS for

Generating Electricity ☐ Power Take-off ☐
Equipped for gasoline ☐ Natural gas ☐ Butane ☐

Firm_____

Address_____

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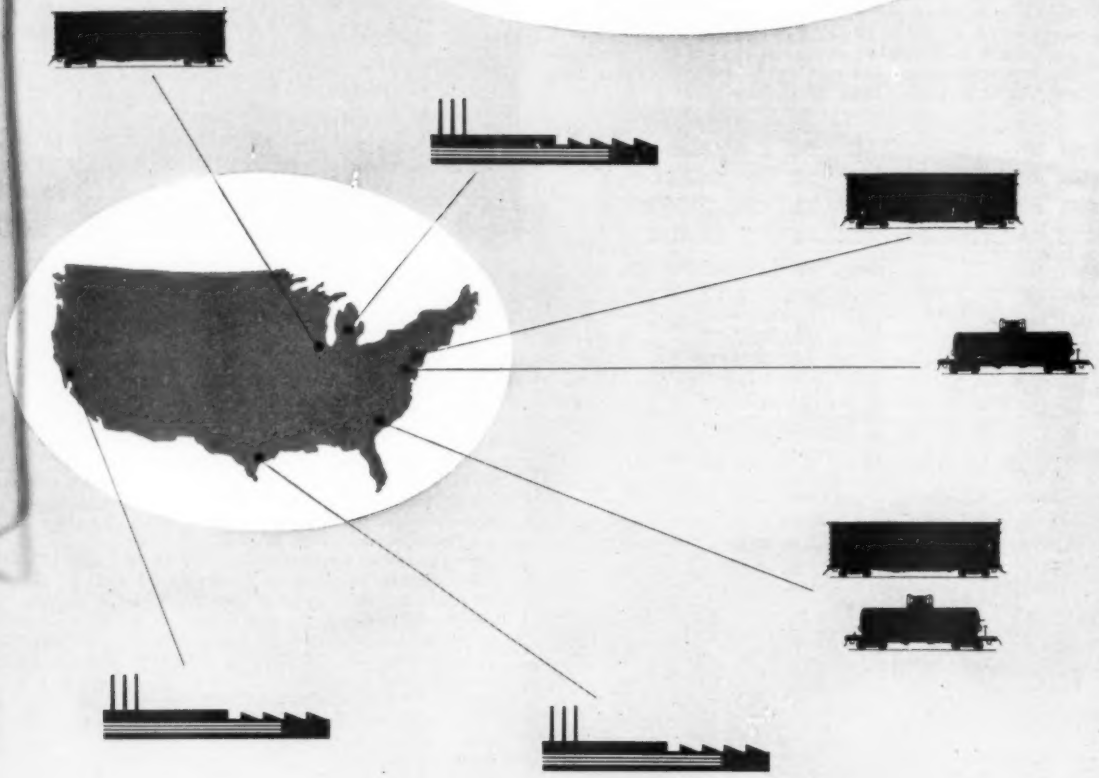
Dow Caustic Soda

serves industry

. . . with unequalled distributing facilities

1. Three producing plants—in Michigan, Texas and California.
2. Caustic Soda Solution bulk tank terminal distributing facilities—Carteret, N. J. and Charleston, S. C.
3. Caustic Soda Solid, Flake and Ground Flake terminal distributing facilities—Chicago, Ill., Charleston, S. C., and Port Newark, N. J.

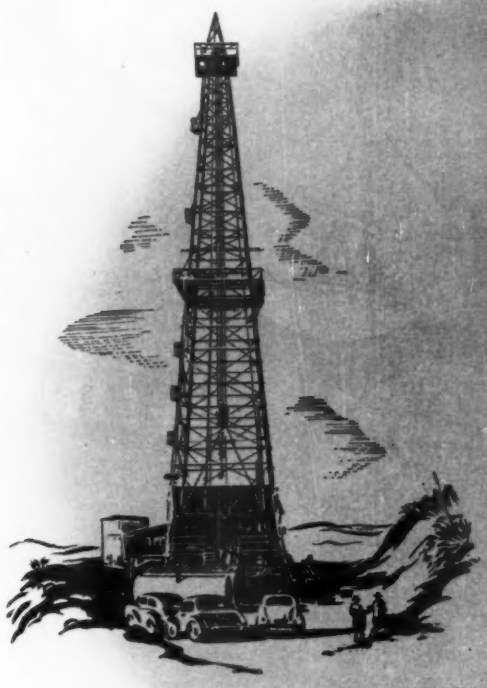


THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

DOW
CHEMICALS
INDISPENSABLE TO INDUSTRY
AND AGRICULTURE

Today it's Roebling!



Why men who watch costs... specify Roebling Preformed

THE RECORDS PROVE IT... that Roebling Preformed "Blue Center" Wire Rope stays on the job longer and cuts your costs. This is partly because "Blue Center" steel—developed and made only by Roebling—has unsurpassed resistance to abrasion, shock and fatigue. In large measure, too, it is because of the painstaking care, special techniques and modern precision machines that guard and maintain Roebling quality leadership.

Preformed a big help, too. Wide experience in the field proves that Roebling *Preforming* brings still more operating economies. Preformed is easier and faster to handle and install. You can cut it without seizing. It winds better... is not apt to set or kink... minimizes vibration and whipping.

Today's best buy. Roebling makes wire rope of every construction, grade and size ... engineered for top efficiency on every type and make of rope-rigged equipment. Have your Roebling Field Man recommend the *right* rope for best, low-cost performance on each installation. John A. Roebling's Sons Company, Trenton 2, N. J.

As rotary drilling lines, Roebling 6x19 Preformed "Blue Center" Steel Wire Rope with Independent Wire Rope Core has demonstrated extra life on the job and substantial dollar savings.

ROEBLING
A CENTURY OF CONFIDENCE
DISTRIBUTED BY
THE NATIONAL SUPPLY COMPANY
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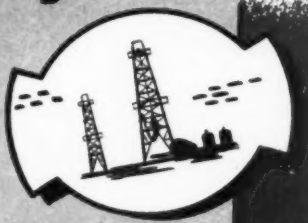
SYMBOL OF SERVICE

to men who buy Equipment for

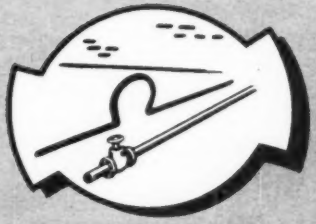
SUPPLY BOVAIRD COMPANY



DRILLING

PRODUCING

REFINING



or PIPELINE

OFFICES AND STORES

ILLINOIS—Clay City,

KANSAS—Chase, Great Be

Russell, W

OKLAHOMA—Duncan, Oklah

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TEXAS—Borger, Dallas, Od

"Buy From Bovaird"

THE Bovaird SUPPLY CO.

GENERAL OFFICES

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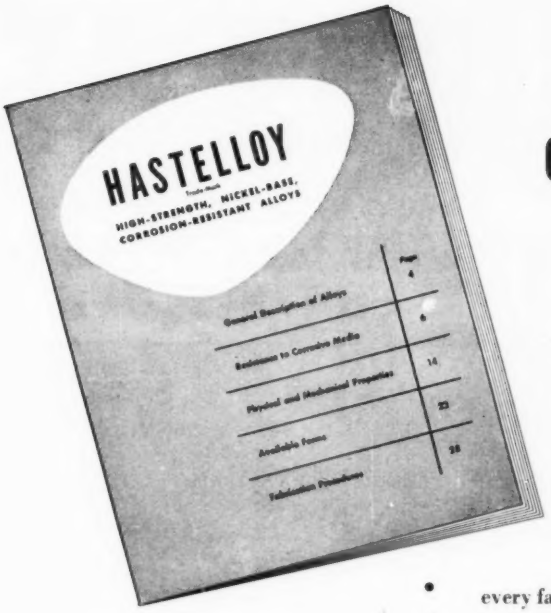


Get the latest data on 4 ALLOYS to combat severe corrosion

Every designer . . . every engineer . . . and every fabricator who is faced with the problem of selecting a high-strength material that will withstand severe chemical corrosion should have a copy of this new 40-page booklet. It tells the story of the four HASTELLOY alloys—what they are, how they are fabricated, and how they can be used to combat severe corrosion.

HASTELLOY alloys are being used successfully in every branch of the chemical and allied industries . . . in the production of chemicals, petroleum, textiles, plastics, aircraft, and metals. To get the latest data on these versatile materials of construction, just fill out the handy coupon below for your free copy of the booklet, "HASTELLOY High-Strength, Nickel-Base, Corrosion-Resistant Alloys."

HERE'S WHAT'S IN IT

Description of the HASTELLOY Alloys—A brief summary of the chemical composition and physical properties of the four alloys: A, B, C, and D.

Resistance to Corrosion—Easy-to-read tables show the resistance of each of the HASTELLOY alloys to 8 common corrosive media.

Physical and Mechanical Properties—Four pages of tables give properties at room temperature and also at elevated and sub-zero temperatures. Graphs compare the properties of HASTELLOY alloys with those of other metals.

Available Forms—HASTELLOY alloys can be supplied as conventional and precision investment castings; hot-rolled bar stock, sheet, and plate; wire, tubing, and welding rod; also, pipe and fittings.

Fabricating Procedures—The proper procedures for welding, heat-treating, hot-working, cold-working, surface preparation, machining, and grinding the alloys are given.

The trade-marks "Haynes" and "Hastelloy" distinguish products of Union Carbide and Carbon Corporation.

HAYNES Trade-Mark *alloys*

Haynes Stellite Division
Union Carbide and Carbon Corporation
UCC

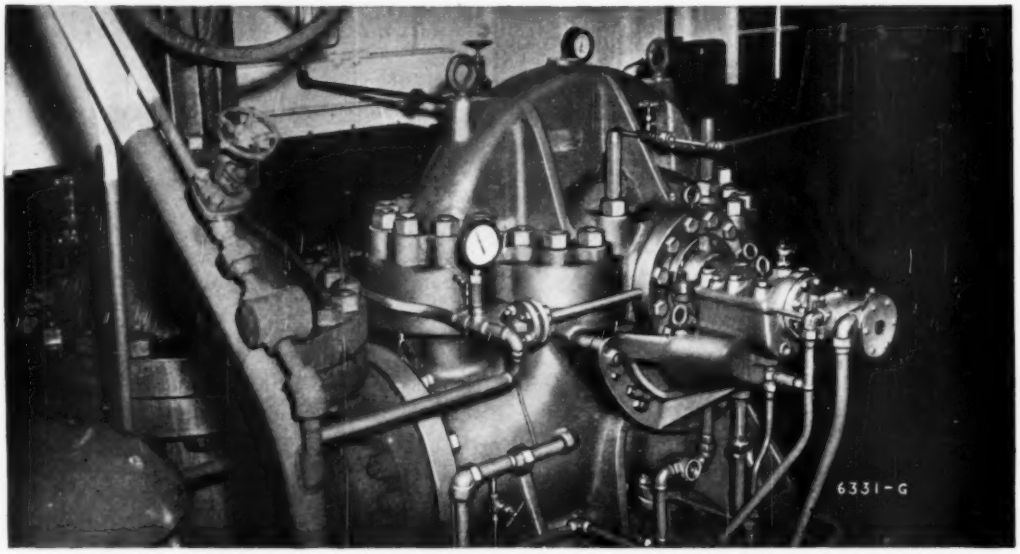
USE THIS HANDY COUPON

Haynes Stellite Division, 725 S. Lindsay Street, Kokomo, Indiana
Please send me the new edition of your booklet, "HASTELLOY High-Strength, Nickel-Base, Corrosion-Resistant Alloys."

NAME_____
COMPANY_____
ADDRESS_____

PRESSURES AT 1000 PSI

NOW PRACTICAL WITH CENTRIFUGAL COMPRESSORS



One of the new De Laval high pressure centrifugal compressors now pumping gas through the Big and Little inch pipelines.

The inherent advantages of the centrifugal compressor—*output flexibility, compactness, simplicity* and *high capacity*—are no longer limited to relatively low pressure service.

The development of a highly satisfactory shaft seal, coupled with other improvements in design, enables us to furnish centrifugal compressors for operation at pressures approaching 1,000 psi. These machines have given thousands of hours of continuous, trouble-free service. No mechanical failures have been experienced, gas leakage past the shaft seal has been nil and efficiency guarantees have been met.

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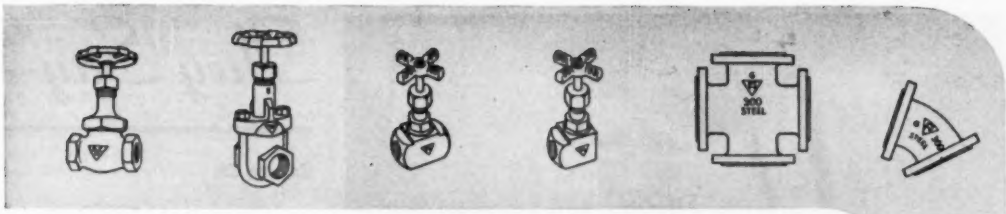
DE LAVAL

DE LAVAL STEAM TURBINE COMPANY, TRENTON 2, N. J.

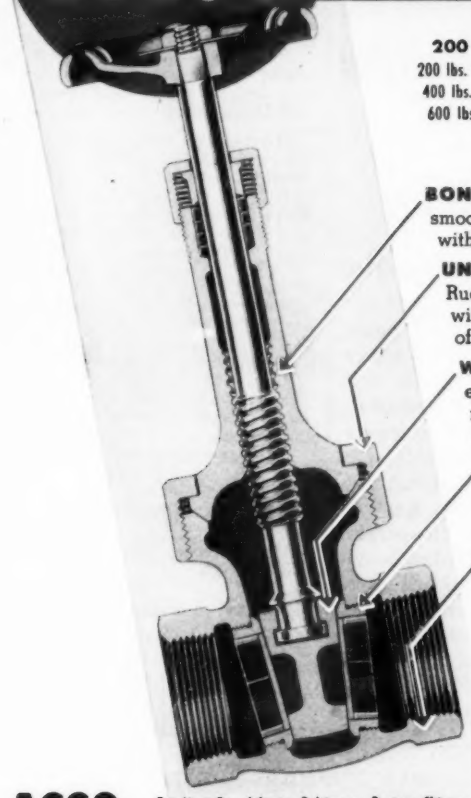
TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

C-12



ASK YOUR R·P&C DISTRIBUTOR ABOUT

R·P&C UNION BONNET BRONZE GATE VALVES



200 LB. CLASS	300 LB. CLASS
200 lbs. steam at 500°F.	300 lbs. steam at 550°F.
400 lbs. OWG (non-shock)	600 lbs. OWG (non-shock)
600 lbs. Hydrostatic Test	800 lbs. Hydrostatic Test

Integral Bronze Seats
Nickel Bronze Seat Rings

BONNET P & C High Test Bronze with smoothly machined bevel for tight joint with body.

UNION RINGS P & C Valve Bronze. Rugged. Permits repeated disassembly without distortion of body or weakening of threads.

WEDGE Nickel alloy. Reversible. Milled grooves engage guide ribs in body, reducing seat wear. With valve full open, wedge clears line of flow.

SEAT RINGS Nickel alloy (renewable in sizes 1" and larger) or bronze, integral with body.

BODY P & C High Test Bronze. Heavy end hexes. Heavy section and strong threads at union for long service.

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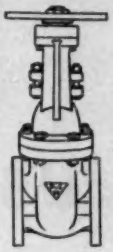

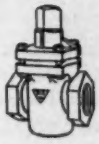

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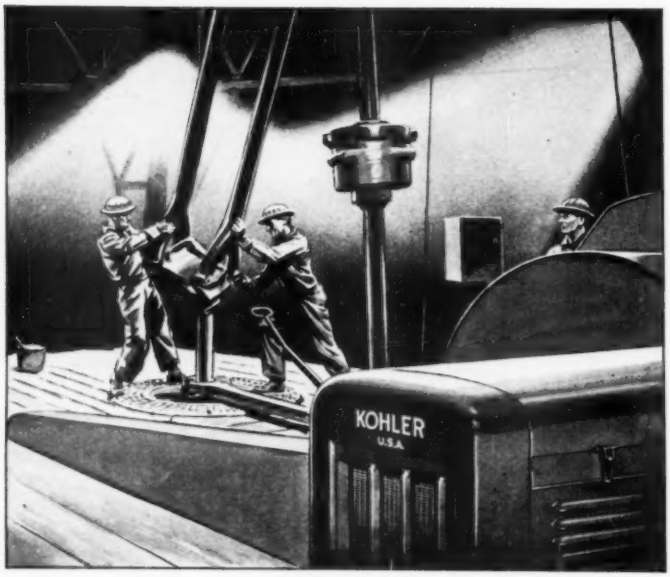

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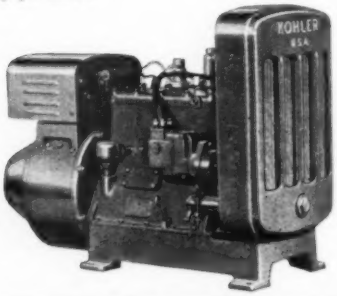

The 3KW plant, shown below, has sturdy, heavy-duty design. Operates for long periods with little attention. Self-contained, self-regulating. Meets severe demands, varying conditions, with minimum interruptions for maintenance and repairs. Easy to mount. Economical to operate. Powered by quick-starting, 4-cylinder, water-cooled Kohler Engine.

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They Say—

Cost of Oil

"Humble's experience demonstrates the need for continuance of the present principles and rates in federal income tax laws regarding depletion and intangible drilling expenses in order that operators may be able to replace the oil being depleted.

"Exploration expenditures, including dry holes and lease purchases, amounted to 77 cents per barrel of oil produced, or more than the maximum depletion under the present tax laws. In addition, expenditures for wells completed as producers averaged 37 cents per barrel of production.

"Combined expenses and investments for replacing reserves amounted to 44 per cent of the gross value of oil produced."

Annual report, Humble Oil & Refining Co.

Research Trends

"During 1949 certain business trends emerged that are likely to have increasing significance on applied research in the future. Chief among these is the emphasis of every kind of business upon cutting costs to preserve profit margins. . . .

"A second, but not so obvious, trend is that toward applied research and scientific fact-finding in problems of marketing, finance, economic planning, sales, transportation, resources, and allied business matters. . . .

"Electrical engineering is another field in which the institute will enlarge its capacities during the coming 12 months. . . .

"Still another trend, and one that has received considerable general notice, is increasing concern with problems arising from polluted atmosphere."

Annual report, Stanford Research Institute.

McCarthy on Imports

"The oil industry is responsible for our world leadership, and Texas is the leading oil-producing state in the nation. . . .

"Every time a barrel of foreign oil comes into this country a barrel less is produced in Texas because it is the only state with a conservation body controlling the oil industry both honestly and efficiently."

Glenn McCarthy, speaking in Gainesville, Tex.

Producer-Gas Comeback

"Producer gas (industrial fuel gas usually manufactured at the plant where used) may be on the threshold

of a comeback. In the first place, it cost less in heating value than distillate (light fuel oil) in 1949, and only slightly more than heavy fuel oil. In the second place, it assures a steady supply of fuel gas. This is important if interruptions of natural gas to industry are likely to occur because of pipe-line breaks or peak domestic demands during severe weather, and if the long-term supply of fuel oil is uncertain. . . . Also, with future development of improved techniques for using low-cost waste coal, producer gas might be made for as low as 25 to 30 cents per million B.t.u."

Paper prepared by Dr. John F. Foster and Dr. Richard J. Lund, Battelle Memorial Institute, presented at American Institute of Chemical Engineers meeting, Cleveland.

Save Your Money!

"Present conditions and those indicated for the future seem to counsel reductions rather than increases in capital expenditures.

"Most economists forecast that the future promises to be most competitive for the oil industry due to the increasing oversupply of oil in all areas in this country. As long as this condition prevails, sound business judgment would dictate caution or retrenchment, even in drilling, if possible, and the industry, if possible within the law, should favor a moratorium on drilling to avoid increasing this oversupply.

"It would seem advisable to adopt this sort of policy rather than to attempt to cure the evils of oversupply with a price-cutting campaign of the type now threatening the industry in some sections of the country."

William F. Humphrey, president, writing in the annual report of Tide Water Associated Oil Co.

Texas Conservation

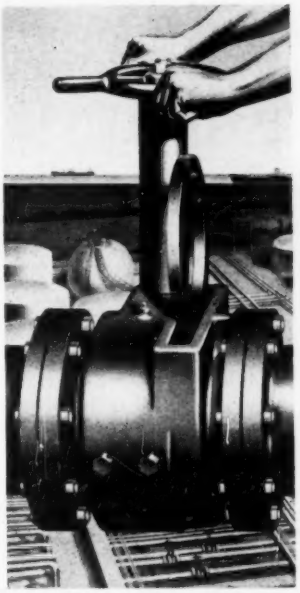
"According to the figures released by the Texas Railroad Commission . . . Texas is still using or returning to the ground within its own borders 85 per cent of all the gas produced from Texas wells. Only 15 per cent is exported to other states, including the fuel-hungry West Coast, Northeast, and Middle West. The total exported is still less than we formerly flared to atmosphere before we learned how to use one of our main muscles—gas—at least three times, once for lifting the oil out of the ground, and then in the pipe lines for domestic and industrial fuel service, and for pressure maintenance or for secondary recovery."

Joseph H. Russell, vice president of Gulf Oil Corp. and Gulf Refining Co., speaking in Norman, Okla.

Report to Employes

"One reason for Texaco job security is the fact that in 1949 we pretty

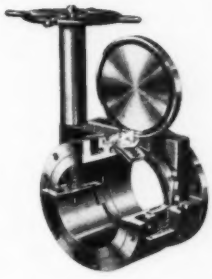
NOW BLIND RIGID LINES
in the COST-CUTTING
HAMER hand wheel operated way



When Hamer Line Blind Valves were introduced years ago, the old expensive and hazardous way of blinding pipe lines with a spectacle bolted between companion flanges became obsolete. The Hamer family of positive, one-man operated line blinding units has now grown until there is *a Hamer Line Blind Valve for every application*—EVEN FOR BLINDING RIGID LINES where no endwise movement is possible.

The new "RIGID" Line Blind Valve solves the problem of blinding inflexible lines in refineries, process plants, tankers and other ships . . . wherever rigid piping installations must be opened and closed. *It's speedy and cost-cutting*—one man can reverse the plate in one minute. It's *safe*—enclosed plate slot prevents spilling line fluid. *It's positive*—there's nothing like a solid plate for a permanent, leak-proof shut-off.

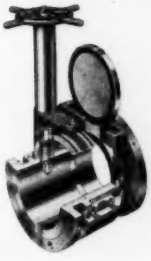
Positive shut-off without pipe line movement!



Actuated by the hand wheel, a smooth-turning ball bearing mounted ring gear moves the sliding internal sleeve in a straight line to clamp and release the plate, eliminating the need for spreading the line. "RIGID" Line Blind Valves conform to A. S. A. Standards for face-to-face dimensions of steel wedge gate valves. In planning new layouts, or modernizing existing installations, use a gate valve for blocking but specify Hamer "RIGID" Line Blind Valves at every point where quick, one-man operated, POSITIVE SHUT-OFF will be required.

LEFT—"RIGID" LINE BLIND VALVE

RIGHT—SPOOL-TYPE LINE BLIND VALVE



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well finished our $625,000,000 job (1946 to 1949) of improvement and modernization, to enable us to match or excel competition.

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"Most people find it difficult to think in terms of millions of dollars. . . . For instance, let's take Texaco's total capital investment of $1,368,132,586 and divide it by 37,799, the number of employes at the end of 1949. That gives us about $36,195, which is what it costs Texaco to provide the plant and tools and other things that make each employe's job possible. . . ."

Report to Employes, The Texas Co.

Underground Storage

"The underground storage of gas in former producing gas fields in the Appalachian area grows in importance as the seasonal demand created by househeating customers continue to increase. The gas obtained from Texas and Mid-Continent fields is purchased uniformly throughout the year in order to obtain the most advantageous price. During the summer months a portion of the gas purchased is stored in 22 underground storage pools in the system's service area for use when needed during the winter heating system.

"Househeating customers require nine times as much gas in a normal January as in August. When the temperature drops to zero, these customers use 15 times as much gas as on a summer day. Storage supplements regular gas supply throughout the heating system and meets the unusual peak demands created by sudden cold snaps."

Annual report, Consolidated Natural Gas Co.

Trade Association Buildup

"The only groups in the United States who could possibly be considered an authority on the subject of a controlled economy meaning certain death to progress, are the trade associations of the United States. Because of their past history, they are now one of the staunchest and best informed opponents to the exotic thoughts of the welfare state and its controlled economy.

"The recent interest in trade associations is the healthiest sign of a slow return to democratic principles, because they represent pure democracy at work; the voice of the people uttered through a voluntary organization operated by them and for the benefit of the community and nation they serve."

Harry F. Bennetts, executive secretary, National Lubricating Grease Institute.

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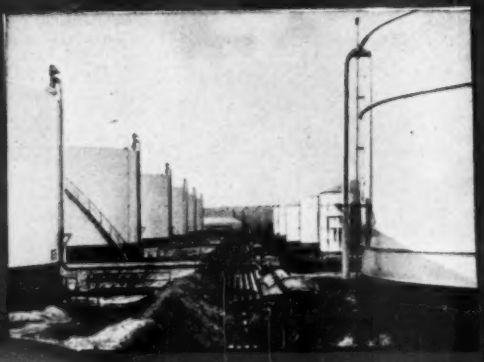

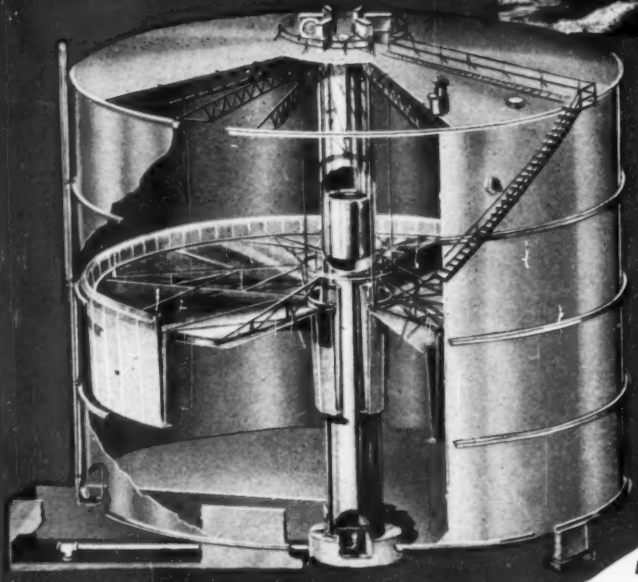

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JOURNALLY Speaking

Shades of Jefferson

THE Journal's official editorial opinion regarding the veto of the Kerr natural-gas bill is expressed by The Boss four pages to the east, but this department is impelled to add its 2 cents' worth of opinion by remarking that it must be a commentary on the trends of the times when Congress can't pass a law to prevent an agency of its own creation from regulating a business which Congress had previously forbidden it to regulate.

Of Grass and Gas

THE classical injunction to make two blades of grass grow where one grew before is being taken literally by the natural-gas industry. More than 40 per cent of the nitrogenous fertilizer produced in the United States now comes from natural gas by processes described on page 138 of this issue.

This is a new development, and the gas industry can thank its lucky stars that it is new. If it had come 20 or 30 years ago there might not be any natural-gas industry today, or what would be left of it would be fighting for its life and the industry's present troubles with the federal Government would be nothing at all by comparison

"Synthetic nitrogen" was a fighting phrase and a political football not so many years ago. Because of synthetic nitrogen the Germans almost won the first World War. During that war our Congress authorized construction of the famous Muscle Shoals dam on the Tennessee River to make nitrogen by an electric-arc process. The war was over and the process was obsolete before the dam was completed, but did that stop the Government? You know the answer.

For years Congress wrangled over what to do with Muscle Shoals. The farm lobby insisted that the Government use it to make fertilizer. So more millions were poured into the project. Then along came the New Deal, and Muscle Shoals was a natural for it. It became the basis for TVA. By that time science had advanced so that very little electricity was required to make nitrogen, and fertilizer was just the tail that wagged the TVA dog.

But the Government had a dam and a power plant, so it went into the electric business. This shift was explained at the time by David E. Lilienthal, then director of TVA, as being a project to "make two globes of glass glow where only one glew before." If you read the papers you know that the Government is still expanding the electric business it got into as a byproduct of synthetic nitrogen, and that the private utility industry is fighting for its life.

Just suppose a process for making fertilizer from natural gas had been known in the Muscle Shoals days. It does not take much imagination to picture the Government building a "demonstration" gas-nitrogen plant and then taking over the entire gas industry.

To toy with Lilienthal's bad pun, if the Government had shifted from grass to gas instead of from grass to glass, it is quite likely that today the free-enterprise electric industry would be sitting back laughing at the government-owned natural-gas industry.

Of course it is unnecessary to add that if the Government had gone into the gas business instead of the power business, there is little chance that this issue of The Oil and Gas Journal would be recording the construction of any such projects as the Transcontinental system, which is described at length beginning on page 81.

The Case of Transco

THERE is a series of special articles in this issue all about a single pipe line. The reason for this is that next week the Natural Gas Department of the A.G.A. is meeting in Tulsa. The gas industry is what it is today because of the technology which makes it possible to build lines such as this. A case study seemed to be an appropriate way to tell the story of natural gas in 1950.

—*Henry D. Ralph.*

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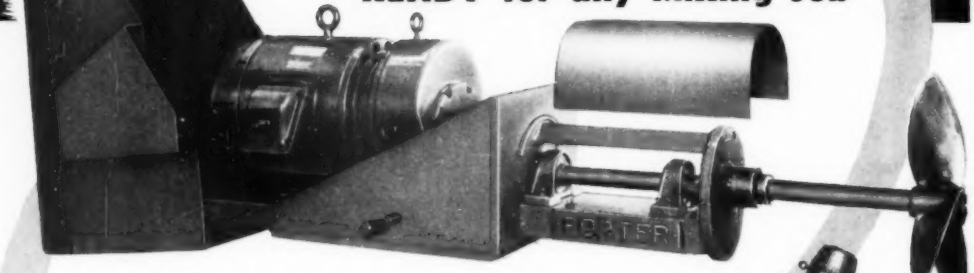

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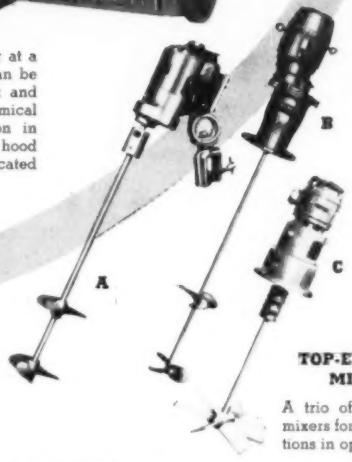

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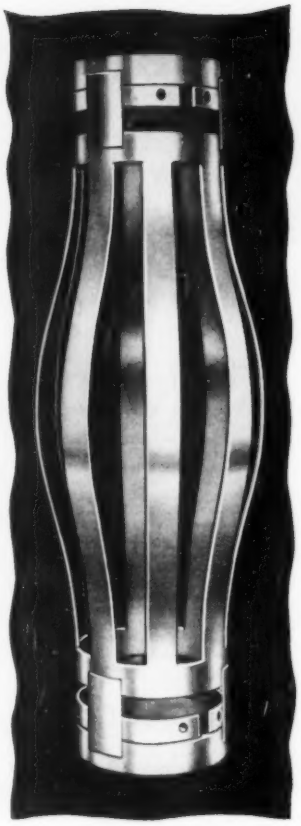


Casing Centralizers provide MAXIMUM CENTERING FORCE

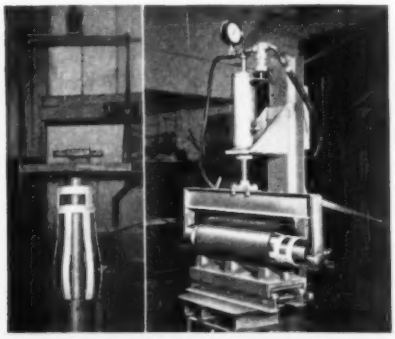
Only when "maximum centering force" is applied to casing at the cementing point, can you obtain a sufficient annular space to permit uniform distribution of the cement slurry completely around the casing. The hazard of channeling is minimized, and chances for successful "first time" cementing are increased.

The test of any casing centralizer is its ability to exert MAXIMUM CENTERING FORCE *after* repeated flattening of its springs during the trip down-hole. That's why the Baker testing laboratory has been kept in constant use during the designing, development and actual proving of the Baker Model "G" Casing Centralizer. Comprehensive tests, simulating every conceivable hole condition to which a centralizer is subjected, were performed in arriving at its efficient design.

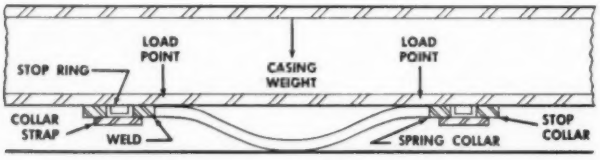
During the course of these tests, every type of spring-equipped centralizer was studied. The exclusive design of the Baker Centralizer proved conclusively to be the optimum.

And here are the outstanding features of the Baker Model "G" Casing Centralizer confirmed by "torture testing" . . . 1. Its MAXIMUM CENTERING FORCE is exerted when it reaches the cementing point, regardless of how many times the springs have been flattened due to "dog legs" or tight spots in the hole. 2. The springs are securely butt-welded to the spring collars in a design that imposes the load point *upon the casing*. 3. *All springs compress simultaneously*, and cannot be compressed individually. 4. The *casing can be rotated* while the centralizer remains stationary. 5. It starts easily, without "snubbing." 6. All parts of the assembly are pre-positioned, ready for immediate, easy installation on the casing.

Ask any Baker representative or office for *your* copy of the new 16-page brochure which contains complete details and illustrations of the Baker Model "G" Casing Centralizer.



LEFT: Testing to determine the maximum number of springs of optimum bowed height to permit easy starting without "snubbing." RIGHT: With this testing device it is possible not only to simulate rugged down-hole travel by repeatedly flattening the springs, but also to find the effective centering force of the centralizer in the open hole after such treatment. The MAXIMUM CENTERING FORCE can easily be determined from a performance curve showing the centering force at various intervals of deflection.



Here is the ideal in spring design and mounting, found only in the Baker Model "G" Casing Centralizer. Note how the load point is imposed directly upon the casing; and how the properly "contoured" spring is free to move along the smooth surface of the casing as it deflects under compression. There is no chance for concentration of stress to cause a permanent set, or breaking of the spring. Note that ample clearance exists between Stop Rings and Centralizer Collars to accommodate the increased length of the springs that results from their complete flattening.

***Remember!* You get MAXIMUM CENTERING FORCE only with BAKER Model "G" CASING CENTRALIZERS**

BAKER OIL TOOLS, INC. HOUSTON • LOS ANGELES • NEW YORK

Public-Relations Job

Those connected with the production, transmission, and distribution of natural gas have a public-relations job to do.

Various explanations are offered as to the why of the narrow approval of the Kerr bill by Congress and its veto by the President. All boil down to the fact that millions of natural-gas users became convinced that passage of the bill meant unjustified returns to producers, for which they would pay in their monthly gas bills. They acted accordingly.

They now have the "know how" of what to do when they feel that their interests are in jeopardy, and so long as they remain confused as to issues they will bring effective pressure at Washington and elsewhere whenever they feel it is necessary.

The only answer lies in a campaign of education which will bring home to all classes of consumers that:

First—The reason they now have the convenient natural gas at reasonable prices is that producers, operating competitively, and subject to state conservation regulations, have been able to develop the proven reserves needed to establish a mammoth service enterprise.

Second—That this service to consumers can only be maintained and expanded if the activities of producers continue free of the paralyzing effects of federal controls.

In connection with the consideration of the Kerr bill, there were those who took the position that "this is something for the producers to worry about," and of no concern to those who have the responsibilities of transmission and distribution.

This attitude at best is wishful thinking. Once federal controls are securely fastened on production, they will quickly extend to the burner tips. Bureaucratic thinking along these lines is apparent in the propaganda of recent years that FPC authority should be extended to include the "end uses" of natural gas. Extension of federal controls means the end of state regulation in distribution as well as production.

In the same category is the contention that the veto of the Kerr bill amendments leaves the natural-gas industry just where it was when the original control act of 1938 was passed. Judicial decisions, and now public opinion, in so far as it is reflected in a presidential veto, have expanded the application in rate making to include production.

There is plenty of evidence that a well-enlightened public opinion does not act blindly and can understand basic issues if properly presented. In connection with the consideration of the Kerr bill there was a flood of misleading statements, including some which came from those who were attempting to be fair in the analysis of the issues involved.

Now is the time for a meeting of minds as to what needs to be done in informing the consuming public—and then to do it.

THIS WEEK

INTERNATIONAL—Mixed Colombian company being formed to take over Tropical's De Mares concession next year. . . . Government will hold minority interest, be required to solve social problems. . . . ¶Argentina reaches agreement with two American firms to permit entry of dollar crude needed to operate five refineries.

ACTIVITY—Crude production for week ended April 29 averaged 4,943,025 bbl. daily, a decrease of 17,100 bbl. daily from previous week but 24,450 bbl. daily greater than same week last year. . . . Well completions totaled 786, an increase of 37 wells over previous week. . . . Wildcat completions were off 23 wells to 134 for the week. . . . Total rotary rigs operating in United States increased 58 rigs to 2,058 on April 24. . . .

TRENDS—Indicated demand for gasoline at refineries in 8-week period ended April 22 was 4.2 per cent greater than same period last year. . . . Demand for middle distillates was up 27 per cent. . . . Residual demand gained 9.6 per cent. . . . Demand for middle distillates in March was greater than in either January or February. . . . ¶Increases in Gulf-East Coast gasoline prices match winter price cuts. . . .

REFINING—Phillips announces it will begin construction soon on 30,000-bbl. catalytic cracking unit at its Phillips, Tex., refinery. . . . ¶Kendall Refining Co. plans immediate start on 1,500-bbl. Platforming unit at Bradford, Pa. . . . ¶California Refining Co. under way on program to double present 25,000-bbl. capacity of Perth Amboy, N. J., refinery. . . . ¶Commerce Department reveals dividends of refining corporations during first quarter were 40 per cent higher than 1949, a greater increase than in any other industry. . . . ¶Waste disposal, corrosion, refinery maintenance highlight discussions at A.P.I. Division of Refining meeting in Cleveland. . . . ¶Du Pont survey shows octane rating of gasoline still going up. . . . Average for regular now 83.2, premium 88.4. . . . ¶Four Texas Co. refineries still shut down by O.W.I.U. strike. . . . Union claims lockout, orders workers to apply for unemployment compensations. . . .

NATURAL GAS—Lone Star Gas Co. announces it will spend $81,000,000 on additional facilities in next 5 years. . . . ¶Clarification of status of independent gas producers not expected for some time. . . . FPC reported undecided on future course after several closed meetings. . . . No legislation expected this year. . . . Industry considering publicity campaign. . . . ¶Senator Kerr tells A.P.I. Cleveland meeting no new gas contracts signed since veto and none expected. . . . J. French Robinson cites East Ohio case as example of what may be in store for entire gas industry. . . .

PIPE LINES—Transcontinental Gas Pipe Line Corp. gets authorization from FPC to boost capacity of its Texas-New York gas line from 340,000,000 to 505,000,000 cu. ft. daily. . . . Expenditures will be raised from $191,500,000 to an estimated $240,000,000. . . . Construction now under way all along the line. . . . ¶Work progressing on Mid-Valley Pipe Line Co.'s crude-oil line. . . . 223 miles already laid. . . . ¶Southern Natural Gas Co. invites bids on 237 miles of natural-gas lines. . . . Announces complete construction plans for 1950 and 1951. . . .

INDUSTRY AFFAIRS—NPC Chairman Hallanan tells Congress work of council and OGD vital to nation's security. . . . Asks that funds be restored to keep both organizations alive. . . . ¶NPC asked to make recommendations to solve problem of imports. . . . Council rejects request for study of supplies and requirements of all energy sources. . . . ¶Texmass given extra 30 days to meet requirements for RFC loan. . . . ¶Problem of excess natural-gas liquids not to be solved for some time, natural gasoline men told in Fort Worth. . . .

WORLD'S LONGEST.—The increasing importance of natural gas and its growing stature as a competitor in the nation's fuels market are symbolized by this picture of construction operations on Transcontinental Gas Pipe Line Co.'s 1,832-mile line from the Rio Grande Valley to New York City. By December 1 this 30-in. line is expected to be making initial deliveries. Eventually, it will be moving 505,000,000 cu. ft. daily, gathered from 34 fields along a 600-mile stretch of the Texas-Louisiana Gulf Coast. A special section on the Transco line may be found in this issue, beginning on page 81.

Refiners' Confab

Corrosion, waste disposal, refinery maintenance problems highlight discussions at annual Refining Division meeting

George Weber

CLEVELAND.—Progress in technology was the principal topic of discussion at the fifteenth annual midyear meeting this week of the American Petroleum Institute's Division of Refining.

Seven technical sessions dominated the 4-day meeting, balancing analytical, corrosion, and motor-fuel research with progress reports on the everyday problems of waste disposal, refinery maintenance, and supervisor training. Also on the schedule were 31 meetings of technical committees and subcommittees.

Waste disposal.—The refining industry was invited to participate with other industries in solving, on a mutually cooperative basis, the waste problems confronting industry today.

The invitation, to participate in a national technical task committee on industrial waste, was extended by Lewis F. Warrick, chief of the technical-services branch of the U. S. Public Health Service's Division of Water-Pollution Control.

Warrick congratulated the refining industry and the A.P.I. for an outstanding job in defining its problems industry-wide and cited as particularly noteworthy the committee on disposal of refinery wastes and the development of the A.P.I. separator.

Refiners were asked to name a representative and an alternate to serve on the national committee, which will function as a technical advisory group.

In a companion paper, Carl E. Schwob, chief of the Division of Water-Pollution Control, discussed the administration and significance of Public Law 845, also called the Water-Pollution Control Act of 1948. The act, he said, provided for the first time a means of stimulating a broad national program of water-pollution control in which close cooperation among state and national governments and industry is indicated.

Air-Pollution Control.—Success with a fog-filter type of unit in reducing certain undesirable odors and gases was reported by E. P. Kropp, of Standard Oil Co. (Ohio).

Kropp's paper covered work done at the company's Cleveland refinery in eliminating air-pollution from batch operation of lube-oil acid treating, grease manufacture, and asphalt manufacture. The author agreed with other investigators in finding low-pressure spray towers ineffective in removing sulfur dioxide from vapor effluents. The company, he said, accordingly turned to experimentation with fog-filter units.

Effective sulfur dioxide removal from lube-oil acid-treating operations led to testing the fog-filter technique in hydrogen sulfide removal, Kropp said. It did not work with pure water, but a 3 per cent soda-ash solution reduced hydrogen sulfide concentration in an air stream from 2,200 to 200 p.p.m. and an 8 per cent solution removed it completely. The same unit using water, successfully removed unpleasant fatty acid odors emitted from grease manufacture, he said.

Award Winners

CLEVELAND. — Two outstanding refining men, Dr. Robert E. Wilson and Dr. W. B. Hart, were presented certificates of appreciation at the dinner meeting of the A.P.I.'s Division of Refining meeting here.

The presentation was made by John W. Newton, vice chairman of the division's general committee, which selected the recipients, and vice president of Magnolia Petroleum Co.

DR. WILSON

DR. HART

The awards are made for outstanding work in the field of petroleum refining.

Dr. Wilson, chairman of the board of Standard Oil Co. (Ind.), was honored for his many years of leadership in the oil industry and particularly in the field of research.

Dr. Hart, an expert on disposal of refinery wastes, is in charge of the gas, acids, and drainage departments of Atlantic Refining Co.'s Point Breeze refinery.

Presiding at the annual dinner was Chester F. Smith, vice president of Standard Oil Co. (N.J.), A.P.I. vice president for refining.

Stream-pollution study.—W. B. Hart, recipient this year of the A.P.I. Certificate of Appreciation for his work on waste-disposal problems, reported on the 3-year A.P.I.-sponsored research project studying bacteria as test organisms for pollution measurement. The work, conducted at Pennsylvania State College, involved study of water from 171 state streams, ranging from unpolluted to heavily polluted samples.

The surprising part of the whole investigation, said Hart, was that the bacteria forms found in these samples were just about as pronounced in number in the polluted water as in the clean water. Studies will be continued on other forms of stream life, including various invertebrates and vertebrates, including fish.

Maintenance reviewed.—A cross-section of industry maintenance problems was represented in papers concerning a new major refinery shop and practices followed in a small refinery.

On work of major scale, Robert Haldane, chief engineer of Shell Oil Co.'s Houston refinery, described Shell's new refinery shop building and told how it is being used.

The 216 by 456-ft. three-bay structure integrates all craft under one roof. This centralization of maintenance, finding increased adoption in major plants, improves materials handling and allows streamlining of routine maintenance and repair work, he said. Shell uses the new shop to best advantage, he added, by employing job expediters who are "short on paper work and long on expediting."

In the smaller refinery a reduced budget for standby equipment makes efficient maintenance of prime importance, according to four representatives of Leonard Refineries, Inc., who discussed "Maintenance Practices in a Small Refinery." The company maintains the necessary flexibility by employing maintenance men trained to handle more than one type of job.

Corrosion session.—As an important division of maintenance, the corrosion problem was given attention in a special session. R. J. Hafsten, Standard Oil Co. (Ind.) outlined methods of combating corrosion on relief valves in sour-crude service.

Hydrogen sulfide, reacting with iron on spring surfaces, produces iron sulfide and free hydrogen, and the latter it was found, diffused into the springs and caused embrittlement and failure. Metallizing springs with aluminum successfully stopped this type of corrosion. Electroplating disk guides with a thin coat of hard chromium eliminated their corrosion, and substitution of higher chromium alloy relief-valve nozzles and disks stopped

intergranular corrosion of those parts.

Cathodic protection of open-box-type coolers costs on the average, about 66 cents per square foot of surface protected, reported C. R. Draughon, Jr., and E. B. McNeil, of Esso Standard Oil Co., Baton Rouge, La.

Experience in this type of corrosion protection, they said, reveals that a cathodic installation can be made for about one-third the cost of replacement. Rectifiers converting 440-volt, three-phase alternating current to low-voltage direct current output were employed in the protection systems at the refinery. The engineers reported that a relatively large anode system must be installed to assure a sufficient current density. For water similar to that in cooling use at Baton Rouge, an average current density of 10 ma. per square foot were recommended.

Research projects.—The importance of evaluating sulfur fractions in petroleum products was reflected in three of the six papers presented in the symposium on analytical research.

Harold K. Hughes and John W. Wilczewski, of Socony-Vacuum Laboratories, reported on a newly devised X-ray procedure for determining sulfur in distillate fuels, using a monochromatic absorption method.

This rapid test, which can be performed by laboratory personnel in 7 minutes, shows promise of expediting routine control examinations where utmost accuracy is not required. Accuracy averages better than 0.09 per cent sulfur. Samples ranging in specific gravity from 0.7 to 1.1 and in sulfur content from 0 to 2.0 per cent have been analyzed satisfactorily by this rapid method. No chemical preparation of samples is necessary, but they must be free of rust, lead, antisludge, and other metal-organic additives to give accurate sulfur determinations, they said.

English contribution.—Two British researchers, F. W. H. Matthews and D. F. Parsons, of Anglo-Iranian Oil Co., Ltd., Research Station in Middlesex, presented a critical study of current procedures for interpretation of results of the common copper-strip test.

Reviewing the shortcomings in color classification, they advocated quantitative evaluation of the sulfur compounds actually present on the tarnished strip.

The "cathodic reduction" method they stated, appears to have much to recommend it and conveys detailed information in a very short time. The constituents of the tarnish film can be readily deduced from the time-potential curve, and their quantities can be calculated. The entire operation, they said, can be performed in about 15 minutes which is a small addition only to the main test."

John F. Wilson, of Union Oil Co.

CHESTER F. SMITH

of California, outlined methods used in analyzing the gasoline fraction of a high-sulfur cracked distillate from a coking operation. The product is first precisely fractionated into a number of narrow boiling-range cuts, and each cut is then subjected to silica-gel adsorption analysis, he said. This sequence is preferred as adsorption separation is much sharper when the sample has a narrow boiling range, he said.

Straight-chain hydrocarbons analysis. A new simplified method for quantitative analysis of linear, or straight-chain, hydrocarbons as distinguished from iso or branched compounds was announced in a paper presented by three members of the Standard Oil Co. (Ind.) research department. In its preliminary stages of development, the method employs the unique property of urea in forming solid complexes or urea-adducts with straight-chain organic compounds, thus allowing their extraction from isomeric mixtures.

Investigators report that at this stage of development the new technique will allow qualitative analysis for hydrocarbons of 7 or more carbon atoms, and quantitative results are possible for hydrocarbons of 14 or more carbon atoms. The authors outlined workable techniques developed to date. They further discussed the possibilities of the method at the same time pointing out its recognized limitations.

Foresight.—The ability to make and use intelligent forecasts is of special importance to refiners in meeting both short and long range challenges said Chester F. Smith, A.P.I. vice president for refining.

Looking to the future, Smith predicted further reduction in residual fuel yields and expressed the opinion that while natural gas will be an active competitor in the distillate and residual markets, it should by no means cause a severe dislocation in present refinery plans.

As to synthetic fuels, he said that whenever it becomes economically worthwhile to make liquid fuels from other raw materials than petroleum the refiner will do it. Increasing development of commercial jet aircraft may require production of more jet fuels sooner than had been anticipated, he said.

Pipe-Line Progress

Symonds outlines economic benefits of new techniques

HOUSTON.—The head of a major crosscountry gas transmission line told an audience here last week that the greatest advance in the industry has been in "the number required and the quality of the workmen needed to build and operate these lines."

Speaking before the Houston chapter of the American Petroleum Institute, Gardner Symonds, president of the Tennessee Gas Transmission Co., said that the speed of laying pipe lines has been doubled in the past 15 years. A pipe-line gang can now often lay more than a mile of 30-in. or larger pipe in a single day.

"Due to mechanization, hand labor has been reduced by about 75 per cent. The fewer men used now have greater skills and higher pay," he said.

Symonds cited developments in welding techniques which, he said, made possible the present-day continuous steel tubes with the weld often stronger than the pipe itself.

More powerful and economical compressor engines for gas transportation are being developed, the Tennessee Gas president asserted. "A 99½ per cent running time for an engine is the rule rather than the exception," Symonds said. "As part of our effort to continue to develop a more economical way of moving gas, we will this year install a gas-fired, turbine-driven centrifugal compressor engine of 5,500-hp. at one of our stations."

Pointing out the economic advantages of the modern gas-transmission system, Symonds said Tennessee Gas has a total labor cost, including all employe benefits, of only 10 per cent of the gross revenue.

Symonds revealed a new and unusual device which Tennessee Gas will utilize to keep abreast of the development and progress of its large construction program. In connection with its 1950 construction program, the company is going to make a newsreel-type movie film once each month. It will be shown to officers, directors and others vitally interested in the progress of the line "so that they can actually see the step-by-step and day-by-day transformation of money and labor into a pipe-line system."

Government Threat

A.P.I. meeting told that too much government will cause trouble for the industry in the future; FPC control cited

Kenneth B. Barnes

CLEVELAND.—The American oil industry was clearly warned of trouble ahead from the federal Government at the meeting here April 26-28 of the Eastern District of the American Petroleum Institute's Division of Production.

The warning was not only of trouble ahead but of trouble now, involving federal control, throttling federal restrictions, both present and growing, plus more bureaucratic red tape and the possibility of tax changes via the depletion allowance on oil production.

Only timely intervention by Congress to preserve its original intent in the Natural Gas Act can now avert federal seizure of the state and local regulation of natural-gas distribution, said J. French Robinson, president of East Ohio Gas Co.

Adoption of the Treasury Department's recommendation to slash the depletion allowance on income from oil production "would pull the rug out from under the industry's productive capacity, immediate and future," warned W. T. Holliday, chairman of the board, Standard Oil Co. (Ohio).

The presidential veto of the Kerr amendment to the Natural Gas Act "will clamp a deep freeze on the business of selling gas in interstate commerce," predicted Sen. Robert S. Kerr of Oklahoma.

Restricted industry.—Senator Kerr's address here was his first detailed public remonstrance to President Truman's recent veto of the Kerr natural-gas bill.

Kerr told the A.P.I. meeting: "Now that the veto has made the threat more nearly a reality not a single new contract to sell gas has been signed. In my opinion none will be signed. And this will mean," he continued, "that producers will not be free to sell more gas for present consumers nor any gas for future consumers."

Unregulated independent producers, Kerr said, have been discovering and developing additional supplies of natural gas at a far greater rate than that at which demand increased, and the Kerr bill "was the only insurance policy for the supplies to continue to grow and expand."

Contrasting the record of regulated and unregulated gas producers, he said: "All the regulated companies in the nation have drilled, on the average, fewer than 12 wildcat or exploratory wells per year for the past 10 years. Independent operators have drilled approximately 8,000 such wells each year for the past 4 years. During the war years, in spite of scarce materials and equipment, the independents drilled an average of 5,000 such wells per year."

R. S. KERR

J. F. ROBINSON

The nation's known gas reserves have been tripled in the past 12 or 15 years, he said, "solely because of the wildcat or exploratory wells drilled by independent producers."

Discussing increases in average prices paid independent producers in contracted prices for gas since 1946, Kerr said: "With these increases, the over-all average being paid today for all of the gas furnished by Southwest independent gas producers is still less than 6 cents per thousand. And the over-all price paid by the consumer today is 12 per cent less than it was 10 years ago."

Kerr then asked, if threatened regulation has brought some scarcity and some increase in prices, what will actual regulation bring?

"The answer must be still greater scarcity and thus still higher prices," he said. "If the principle of the Kerr bill does not prevail, the result will not be more gas to the consumer at less cost. It can only be less gas to the consumer at higher cost."

He attacked claims of opponents that the Kerr bill would boost gas prices to consumers by hundreds of millions, stating that the gross amount all independent producers in the nation receive is less than $75,000,000 a year. "The Kerr bill," he said, "would not have changed the price of any part of that gas. All the gas now going to consumers everywhere moves under contracts by which present prices are extended far into the future."

East Ohio's case.—What the Federal Power Commission and the Natural Gas Act are doing to one company was explained by Robinson. The U. S. Supreme Court on January 9 reversed a lower court decision of February 1949 that East Ohio Gas Co. was not a natural-gas company under the Natural Gas Act.

"We believe it simply inconceivable that the Natural Gas Act could be construed to have any clause putting our local intrastate firm under FPC control," Robinson said, "but we were caught in a crossfire of FPC orders that has continued ever since passage of the Natural Gas Act."

He said that East Ohio Gas Co. and the Ohio commission have no conceivable need "for the yoke of FPC." Robinson charged that the authority of every state public-utility commission in America is being challenged by the federal Government.

A highlight of Robinson's address was concerned with important questions that could be asked of any operator or concern having natural-gas interests. The questions were put forth by Robinson in the following manner:

"Would you be alarmed if these questions could be answered yes?

Question 1.—"Is the authority of every state public-utility commission in America being challenged by the federal Government?"

Question 2.—"Will virtually every natural-gas distributing company in

Kerr Cites Example

FPC power.—"If a regulated company spent $2,000,000 in exploration and found no new reserves, the FPC would be the sole judge of how much, if any, of the money so spent could be added to the rate base and recovered by the company, and how many years must be taken in which to recover it.

"If, however, this regulated company spent this $2,000,000 in exploration and found $50,000,000 worth of gas, it would not be one penny better off by reason of such discoveries than it would have been had no gas been found. The FPC would still determine what part of the cost, not to exceed the total of $2,000,000, would be added to the company's rate base and how many years must be taken in which to recover it.

"In either event, the company would be permitted to earn 6½ per cent on the $2,000,000 cost or the unrecovered part thereof."

"Funny" bookkeeping.—"On the other hand, if the company borrowed $50,000,000 and bought that amount of new reserves, it would be permitted to earn 6½ per cent over and above all interest charges, amortization costs, and all the expenses on the unrepaid portion of the fifty million."

Result.—"Thus, a regulated company is penalized by small or inadequate return on what it spends in exploring for new reserves whether it finds any or not. On the other hand, if it acquires new reserves by purchase at the highest prices permitted by FPC, it is richly rewarded."

New officers of the Eastern District of the A.P.I.'s Division of Production, elected April 28 in Cleveland. Left to right are Richard W. French, vice president of Sohio Petroleum Co., Cleveland, vice chairman; J. E. Schaefer, superintendent of lease department of East Ohio Gas Co., Cleveland, retiring chairman and new chairman of the advisory committee; Jack Cashell, vice president of Preston Oil Co., Columbus, secretary-treasurer; John T. Galey, independent producer, Pittsburgh, vice chairman; and K. C. Cottingham, geologist with Ohio Fuel Gas Co., Columbus, chairman.

America soon be under direct regulation of the FPC?"

Answer.—"The Ohio Public Utilities Commission and East Ohio Gas Co. have learned that the answer to not one—but to both—of these questions is **yes.**

Detail on No. 1.—"The State of Ohio and the Ohio Commission have been judicially stripped of a substantial share of their authority, despite courageous opposition. . . . The same dismal prospect is faced by every other state commission and by nearly every other natural-gas distributing company in America. . . . This is the reason why 40 state commissions joined Ohio, the Ohio Commission, and East Ohio in a final appeal to the Supreme Court for the preservation of state rights and the rights of **intrastate** business. . . . This appeal, an appeal not only by East Ohio but by the aroused official representatives of five out of every six states in this Nation, was denied by the Supreme Court on February 19, 1950."

Detail on No. 2.—"The FPC . . . issued an order in which it found East Ohio to be a 'natural-gas company' within the meaning of the Natural Gas Act and subject to FPC control. It ordered East Ohio to file an inventory and a statement of the original cost of many of its properties. This order was entered on the FPC's own motion, and **without a hearing** of any kind. . . East Ohio is an Ohio corporation engaged in the **direct local distribution** of natural gas by means of an extensive pipe-line system totaling 8,076 miles. None of its pipe lines crosses state lines. None of the gas in East Ohio pipe lines flows out of Ohio. None of it is sold for resale. The gas which East Ohio buys from interstate companies is delivered inside the Ohio State lines, and flows continuously some 100 miles in the company's large high-pressure lines to the areas of principal distribution. . . . If FPC could wrest control of East Ohio from the Ohio Commission, it would have a clear precedent for doing the same thing with every natural-gas distributing company and every commission in every state in America."

Imports Protest

Touring House group hears complaints of Independents

A SUBCOMMITTEE of the House small-business committee, in a tour last week of the Southwest, heard first-hand information on what the domestic producer thinks of foreign-oil imports.

Everywhere the members went they were met with the same protest: imports are having serious effects on the states' oil production.

Headed by Rep. Eugene J. Keogh (Dem., N.Y.), the subcommittee held hearings in Oklahoma City, Little Rock, Santa Fe, New Orleans, Shreveport, Lake Charles, Jackson, and Amarillo.

Gov. Roy J. Turner of Oklahoma told the committee in Oklahoma City that foreign-oil imports threaten the economy of his state and the security of the nation. He said that imports have "damaging effects on small producers, and large companies have less incentive to drill deeper and deeper for oil, something which is becoming increasingly necessary in Oklahoma."

In New Orleans B. A. Hardey, former conservation commissioner and chairman of the State Mineral Board of Louisiana, told the committee that more foreign oil coming into the country will cause the domestic petroleum industry to dry up.

Hardey, of Shreveport, said: "When a weak market develops because of the influx of imported oil, Louisiana will be one of the states to get hurt more seriously in the long run." He said a solution to the import problem would be an import tax on a graduated scale.

Gov. Sid McMath of Arkansas told the group in Little Rock that because of the importance of oil in his state, "we are gravely concerned with the rising tide of importation of foreign oil. Excessive imports have already caused serious injury to the petroleum industry in Arkansas and to our overall economy. If permitted to continue, the effect will be disastrous."

George Holden, of the Louisiana State Conservation Department, said that foreign imports had forced his state to consider market-demand factors in setting the allowable oil production. This had not been necessary before March 1949, he stated.

O. C. Bailey, Arkansas Oil and Gas Commission chairman, said increasing oil imports "forced the commission to issue an emergency order cutting production in all controlled fields by 15 per cent last June. Since most of our production in controlled fields is from deep wells and drilling costs are expensive, this was soon reflected in a decline in drilling activities."

Texaco Strike

Only one of five refineries struck by union operating

ONLY one of the five refineries of The Texas Co. struck by the Oil Workers International Union (C.I.O.) April 4 was operating this week.

That was the 27,000-bbl. refinery at Lawrenceville, Ill. Four others with a combined daily capacity of 202,000 bbl., at Port Arthur and Port Neches, Tex., and Casper, Wyo., and Lockport, Ill., remained shut down.

The union claimed a lockout existed at the four closed refineries and ordered its members to seek unemployment compensation. Whether such compensation would be granted was an important, but unanswered, question this week.

Administration of unemployment compensation is vested in the states and the federal Government has nothing to say regarding eligibility. In Texas, where the first struck workers applied, the law provides compensation in cases of a lockout but not of a strike.

Texaco officials denied a lockout existed, saying that the plants had not been reopened, although workers had offered to return to work, because the union refused to guarantee against another strike in the near future.

At Casper refinery workers returned to work April 21, but on April 24 the union served notice they would strike again. On April 25 the company was notified the strike had been postponed indefinitely, a union announcement said, but the following day, the union charged, the company refused entrance to the workers. Tex-

aco officials said the company asked, but did not receive, assurance against another walkout within 60 days.

In a letter to the Journal, O. A. Knight, union president, said the union's legal department is filing a counter action against Texaco in answer to the damage suit Texaco filed in federal District Court in Beaumont. *(The Oil and Gas Journal, April 20, page 142.)*

Knight said the union is asking that the company's suit be dismissed and that the union be awarded $2,000,000 damages "caused by the lockout" and that each worker be awarded wages lost during the labor dispute.

Issues in the strike remained the same. The union wants the right to strike later for 40 hours' pay if the 36-hour week is adopted; the right to bargain nationally on issues of national scope, such as retirement; and prohibition against supervisory personnel performing any rank-and-file tasks.

Merger Vote Scheduled

A special meeting of stockholders of Sunray Oil Corp. will be held June 19 in Wilmington, Del., to consider the company's proposed merger with Barnsdall Oil Co. A meeting of Barnsdall stockholders will be held on the same date.

The agreement of merger between the Sunray and Barnsdall boards of directors was signed in New York April 25.

C. H. Wright, Sunray president, said May 1 that Barnsdall stockholders will be offered three shares of $20 par value new convertible preferred stock for each share they now hold in Barnsdall. At present Sunray owns 800,781 shares of Barnsdall, with 900,000 publicly owned.

The Race Is On!

Du Pont survey shows national average octane rating of regular-grade motor fuel now 83.2, premium gasoline 89.4

WHAT folks say about the octane race is true. The octane rating of gasoline is climbing steadily.

Substantiation for the belief may be found in the latest quarterly survey, published last week, of the petroleum-chemicals division of E. I. du Pont de Nemours & Co., Inc.

In a 45-city survey, Du Pont found that the research number of regular-grade gasoline had climbed to an average of 83.2, compared with 82.1 in October and 81.5 last May, and the research number of premium motor fuel was up to 89.4, compared with 88.2 in October and 87.2 a year ago.

The survey involved tests on 655 samples, including 327 premium and 328 regular grade. The samples were purchased from retail outlets in 42 cities in the United States and 3 in Canada.

In every city in this country where samples had been tested in a previous survey, the Du Pont study showed a gain in the octane number of regular-grade gasoline. Only Toronto showed a decline, compared with a year ago, and there the number was higher in April than October.

Premium gasoline also was improved, with only Casper, Denver, and San Francisco reporting a rating lower than a year ago.

The samples, where possible, were taken from the same service stations sampled in previous surveys, the report said, and all samples were picked up between March 30 and April 11.

The Du Pont report said brands were picked which were considered representative of the range of quality offered in a particular area, with all samples obtained from service stations appearing to have a reasonable turnover.

The large accompanying table shows the tests in April as compared with previous tests in October and May of 1949, based on the A.S.T.M. research method of rating. Findings of a similar study made in January were published in The Oil and Gas Journal, February 2, page 24.

Use of tetraethyl lead showed a slight drop during the past months, the survey showed, but the quantity used still was above that of a year ago.

Unweighted averages of the ratings for all cities as reported by Du Pont for both research and motor methods of rating are shown in the small accompanying tables.

PREMIUM OCTANE NUMBER

Motor			Research		
May	Oct.	Apr.	May	Oct.	Apr.
80.1	79.7	81.1	87.2	88.2	89.4

REGULAR OCTANE NUMBER

Motor			Research		
May	Oct.	Apr.	May	Oct.	Apr.
76.2	76.4	77.2	81.5	82.1	83.2

TEL CONTENT
(cc. per gallon)

Premium			Regular		
May	Oct.	Apr.	May	Oct.	Apr.
2.01	2.04	2.03	1.53	1.65	1.60

COMPARISON OF MOTOR-GASOLINE SURVEYS FOR MAY 1949 AND JANUARY 1950
(Octane numbers by research method, arithmetical averages by cities)

	Premium				Regular			
	Octane No.			TEL content cc./gal.	Octane No.			TEL content cc./gal.
	May '49	Oct. '49	Apr. '50	Apr. '50	May '49	Oct. '49	Apr. '50	Apr. '50
Aberdeen			86.6	2.23			80.4	1.49
Amarillo	82.3	85.8	87.7	2.55	78.6	79.5	80.3	2.44
Atlanta	89.4	89.2	91.0	1.67	82.8	84.7	84.9	2.00
Bakersfield	87.1	87.7	88.8	2.50	79.1	80.2	80.6	1.56
Baltimore	89.2	90.6	91.8	1.49	84.2	83.8	85.6	1.25
Boston	90.1	90.3	91.5	2.10	84.8	85.0	86.4	1.60
Calgary			84.4	2.10			79.3	1.88
Casper	85.8	88.4	88.1	1.60	79.8	80.4	82.0	0.95
Charlotte			90.9	1.54			84.8	1.72
Chicago	85.4	85.5	88.2	1.97	79.6	80.9	82.6	1.60
Cincinnati		88.7	89.8	1.76		83.4	85.1	1.38
Cleveland		89.6	89.8	2.03		84.4	85.2	1.41
Columbus		89.8	89.8	2.10		84.6	85.4	1.40
Corpus Christi	90.4	90.5	92.2	1.65	83.5	83.3	85.1	1.58
Dallas	85.3	88.4	92.0	2.27	82.4	83.2	84.0	2.00
Denver	84.9	88.2	87.6	1.09	78.3	80.3	81.4	0.88
Detroit	87.0	88.4	90.2	2.04	82.6	83.3	84.2	1.14
El Paso	81.6	84.4	85.5	2.43	76.2	75.2	76.5	1.47
Great Falls		85.5	87.1	1.78		80.0	80.8	0.89
Houston	89.2	89.5	92.2	2.03	83.4	83.3	84.9	1.86
Indianapolis			88.1	2.58			83.0	1.95
Jacksonville			90.6	1.52			85.6	1.61
Kansas City	85.4	87.0	89.6	2.12	79.9	81.3	82.8	1.74
Little Rock			90.6	2.20			84.2	1.78
Los Angeles	89.8	90.0	90.1	2.17	82.1	82.3	82.8	1.30
Louisville	87.0	88.1	90.9	2.41	81.6	82.8	84.5	2.38
Memphis	88.4	88.7	90.2	2.25	82.9	83.9	84.8	1.97
Milwaukee		88.2	88.3	2.27		81.1	82.4	1.70
Minneapolis	84.8	85.8	87.6	2.39	79.5	79.7	80.6	1.43
Montreal	86.9	86.8	88.7	1.99	82.3	82.4	84.2	1.75
Nashville			90.5	2.06			84.7	1.85
New Orleans	87.7	88.6	90.5	2.16	82.7	83.5	85.6	2.17
New York	88.7	89.2	90.8	2.13	84.1	84.3	85.4	1.53
Omaha			88.3	2.53			80.9	1.41
Philadelphia	89.5	89.7	91.7	1.86	84.8	84.5	86.4	1.58
Pittsburgh	89.7	90.8	91.6	2.17	84.7	84.5	85.8	1.95
St. Louis	86.2	86.4	88.9	2.14	79.9	81.5	83.3	1.61
Salt Lake City	84.5	87.7	88.5	0.87	76.9	78.4	80.1	0.81
San Francisco	91.0	90.7	90.7	1.96	81.9	81.9	83.2	1.18
Seattle	90.1	90.8	90.9	1.73	81.4	81.4	82.7	1.31
Shreveport			89.8	2.54			84.4	2.18
Spokane			89.1	1.51			82.4	1.19
Toronto	86.4	86.3	87.0	2.36	82.6	82.2	82.4	1.78
Tulsa	86.5	87.2	88.6	2.57	80.2	80.7	81.3	1.95
Wichita		85.7	86.8	2.11		80.0	81.3	1.81

Half of the panel which conducted the "Information Please" session at the N.G.A.A. meeting. Left to right are J. B. Taylor, Signal Oil & Gas Co.; T. O. Kuivinen, Cooper-Bessemer Co.; W. S. McAllister, Warren Petroleum Corp.; H. R. Legatski, Phillips Petroleum Co.; M. V. Cousins, United Gas Co.; and Mark Patton, Hurley Gasoline Co.

Gas-Liquids Forum

Panel of experts at N.G.A.A. meeting considers need for more natural-gasoline outlets, sees no early solution

Roy F. Carlson

FORT WORTH.—Excesses of natural gas liquids are not going to be used up quickly, and the problems of natural-gasoline producers, particularly those who manufacture L.P.G., are not going to be easily solved.

Addresses of speakers and testimony of experts from several related engineering fields repeatedly told an "Information Please" session of the Natural Gasoline Association of America that the critical oversupply of natural gas liquids has no immediate workable outlet.

Most interest at this panel meeting centered around possible outlets for natural gasoline. One of the questions put to the panel asked why refiners are not using larger amounts of this product.

To this question the panel gave three answers: The present high octane ratings required of motor fuels preclude the use of large amounts of natural; the limited vapor-pressure range required of motor fuels restricts the use of natural; and the large numbers of catalytic cracking units that have been constructed produce a large quantity of motor fuels that do not need natural gasolines as a blending agent.

Underground storage.—That some operators are thinking of storing propane and butane underground was shown by questioning of reservoir engineers and operators who have already tried these projects. Testimony showed that pure propane can be injected into a wet-gas reservoir, provided proper conditions of porosity, pressure, and permeability exist, with assurance than an appreciable percentage of the injected fluid will be reproduced in a pure state. It was pointed out, however, a considerable quantity of mixing will take place.

Injection of propane into a crude-oil reservoir should be approached with caution, however, because, with some types of crude an underground deasphalting unit may effectively be set up that will harm the reservoir, the gasoline men were told. This, it was shown, also may happen in pipe lines that are used for batching crude and products.

Underground storage of L.P.G. during periods of low demand has, according to the experts, merit in solving seasonal demand problems. In addition, the use of underground storage to insure large continuous supplies of L.P.G. has application with various refining processes for conversion to motor fuels.

Upgrading natural.—These processes, involving cracking of the light hydrocarbons such as ethane, propane, and butane with later polymerization to heavier products used in motor gasolines, give a rather low percentage yield from feed stocks, the panel agreed. But if supplies of light-hydrocarbon feed are large enough, the experts said, these refining processes are economically sound. The cracking processes are needed to prepare the feed stocks for later polymerization into the heavier compounds, and also result in the later losses. The processes were said to yield a high-quality motor fuel that, with leading, is in all ways comparable to refined gasolines.

Effect of veto.—A representative of the Texas Railroad Commission told the N.G.A.A. group he thought that the veto of the Kerr bill could result in a rise in the price of natural gas because it may have the effect of decreasing the supply of gas. Producers, he said, may not make their gas available to pipe lines.

He further added that he did not expect any naming of shutdown days for wet gas wells if shutdowns become necessary since, when it was tried before, it played hob with the operation of processing plants. It would be better, he said, to let

The other half of the panel: Left to right are Will Swerdloff, Magnolia Petroleum Co.; Glenn O. Wynn, Mid-Continent Petroleum Corp.; S. S. Smith, Shell Oil Co.; Dr. D. L. Katz, University of Michigan; D. A. Klemme, Stanolind Oil & Gas Co.; and Jack Baumel, Texas Railroad Commission, who is mislabeled on the identification placard.

operators plan their own periods of shutdown.

Plant operation.—A discussion of the operation of hydrogen sulfide removal plants showed that there has been no great amount of trouble, although some embrittlement has been experienced. This embrittlement has been noticed in nonstress-relieved vessels and has been caused by decomposition products of treating agents, the gasoline men were told.

Carbon formation on the intake ports of two-cycle engines has probably been caused by the lube oil, according to engine experts. The intake ports apparently form an edge upon which the oil is wiped, and since temperatures around the ports vary widely, carbon is formed. It apparently does not get hot enough in the vicinity of the ports to burn off the carbon as it does higher in the cylinder, they said.

SOUTHWEST

New Cat Unit

Phillips reveals plans for 30,000-bbl. unit in Texas

BORGER, Tex.—A 30,000-bbl. catalytic cracking unit will be added to the processing facilities of the Phillips, Tex., refinery of Phillips Petroleum Co., according to an announcement here by K. S. Adams, president.

Contracts for the construction of the unit will be let in the near future, and it is expected that it will be on stream by August 1951.

Plans for the new unit were made known here April 28 at a dinner attended by Phillips officials, representatives of trade unions, and city officials. The new processing unit will increase the refinery production of high-octane gasolines and distillates and reduce the production of residual fuel oils.

The refinery at present has a crude-oil capacity of 56,000 bbl. daily. Existing catalytic cracking, thermal cracking, alkylation, reforming, and viscosity reducing provides a capacity to supply 23,000 bbl. daily of finished gasoline. The existing catalytic cracking is the Cycloversion type which was developed by Phillips research and development department.

Phillips' light products are shipped north by the company's pipe line extending from Borger to Chicago via Kansas City and St. Louis. The company also operates a 38,000-bbl. refinery at Kansas City, Kans. Both refineries use the product pipe-line facilities of Great Lakes Pipe Line Co. with connections at Kansas City.

Through Alamo Refining Co., a 100 per cent subsidiary, the Phillips company operates a 25,000-bbl. refinery at Sweeney, Tex. Through Wasatch Oil Refining Co. and Wasatch Oil Co. the company has refining facilities in Utah and Idaho.

More Reefs

Barnsdall hits in Kent; Warren opens Scurry pool

Kenneth B. Barnes

CLAIREMONT, Tex.—Barnsdall Oil Co. has discovered Canyon reef oil production with its first well on the 27,000-acre Kent County block acquired, with Seaboard Oil Co., from the L. H. Wentz Estate last January in a $10,000,000 cash and oil deal. *(See The Oil and Gas Journal, January 19, page 41.)*

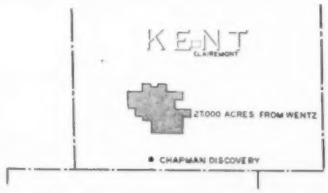
That deal also included 982 semi-proven acres of reef reserves in Scurry County, which many observers thought at the time were well worth the purchase price alone. So the new discovery on the 27,000-acre Wentz block makes the Barnsdall-Seaboard purchase now appear the outstanding acquisition of reserves by purchase in this "hottest" West Texas oil play.

The Barnsdall-Seaboard discovery is in the west central portion of the Wentz block, the discovery well being 1 Spires, located 330 ft. from north and 1,980 ft. from west lines of Section 22, Block 4, H&GN Survey.

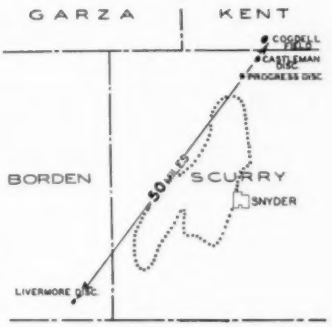
The wildcat encountered the reef top at —4,618 ft. (elevation 2,157 ft.). After perforating at 6,755-71 ft. and acidizing with 1,500 gal., flow was 200 bbl. in 12 hours through ½-in. choke. Gas oil ratio was 584 and crude gravity 42°. The well previously had found the Ellenburger dry in drilling to total depth of 7,564 ft.

When the Wentz block was acquired it had already been tested, some years previous to the reef play, by one deep, dry hole in its approximate center, the well being in the northeast corner of Section 44, which went to 7,762 ft. However, oil detection methods in reefs were not then well developed. It may be that well, with reef top at —4,626 ft., also will now prove to be productive.

The Barnsdall company has been singularly successful in the Borden-Scurry-Kent County reef play. The concern was "in" early in the richest part of the North Snyder pool, and it also has developed production in the Kelley and Diamond M areas of Scurry, and opened East Vealmoor pool in southeastern Borden County.



Barnsdall-Seaboard opened a new Canyon reef pool in western portion of Wentz 27,000-acre block.



Warren wildcat has opened a new reef area 2 miles northwest, between the Castleman and Progress discoveries, shown here.

Warren in Scurry.—Another new Canyon reef pool or producing area also has been opened in north central Scurry County, by Warren Oil Corp., Houston, with the 1 Cunningham, 467 ft. from south and east lines, Section 653, Block 97, H&TC Survey.

The new Warren discovery flowed at the rate of 51 bbl. per hour (1,224 bbl. per day) on an 8-hour test through 1-in. choke after 1,000-gal. acid treatment. Top of the Canyon reed was found at —4,405 ft.

Warren already has developed other Canyon reef production west of the Sharon Ridge area and also in the North Snyder pool. The firm's new wildcat discovery is on a 346-acre tract. A second well has been staked.

N.S.W.A.-I.P.A.A. Meeting

LOS ANGELES.—The National Stripper Well Association, which will meet here May 8 in conjunction with the midyear meeting of the Independent Petroleum Association of America, will discuss the nation's stripper-well oil reserves and secondary-recovery methods. Both meetings will be held at the Biltmore Hotel.

I.P.A.A.'s meeting will begin May 7 and run through May 9, and will be devoted to discussion of economic factors on adequate price, market for oil that can be produced, fair tax base.

Labor Contracts Signed

BORGER, Tex.—Phillips Petroleum Co. this week announced signing of labor contracts with 12 operating units involving 3,000 employes in the Borger area.

The agreements will be effective 3 years, terminating May 1, 1953. They affect the refining, natural gas, and gasoline, production, chemical engineering, and warehouse departments, the Panhandle camp, the Plains butadiene plant, and the Philblack plant of Phillips Chemical Co.

Gas Men's Quandary

FPC holds the cards, and nobody's talking; oil industry openly fearful of what may happen following gas-bill veto

Bertram F. Linz

WASHINGTON.—Veto of the Kerr-Thomas bill by President Truman has left the future of independent producers and gatherers of natural gas clouded with doubt. There is no indication that the situation will be clarified for some time to come.

At the Federal Power Commission, officials said that if the independents were brought under control they would have to do considerable thinking about the procedures to be followed, particularly in cases where the gas was produced in connection with oil. They refused to speculate as to what might be done.

John A. Ferguson, director of the Washington office of the Independent Natural Gas Association of America, said the situation was "very confused" and he had so advised association members.

In other quarters similar uncertainty was expressed and there is a general inclination to wait and see what the FPC may do before attempting to forecast what may happen to independent producers brought under its control.

In both FPC and industry circles it was pointed out that the commission has never attempted to regulate the independent producers, and it was generally agreed that the Phillips case on which the commission is about to open hearings will not be typical since that company's operations are on a big scale and involve transportation.

What might happen.—As to what might happen to an independent producer under FPC regulations, industry representatives in Washington could only point to the treatment accorded the pipe-line companies whose production is under commission control.

If the same type of treatment is accorded independents, it was explained, the commission would take the actual cost of the lease, drilling expenses, the actual cost of wells, then figure out the cost of gas produced and set a price which would allow the operator a 6 or 6½ per cent profit, maybe on the basis of actual cost or, if the property had been worked for some time, on a depreciated basis.

As an example, one natural-gas man said an operator might have bought his leases for $1 and then spent $75,000 on development. Even though by the time he came under commission control the property might be worth $5,000,000, the FPC might set the actual cost of $75,001 as the basis for his gas price or even depreciate the property and allow him only $60,000.

In some quarters it is feared that the failure of the Kerr-Thomas bill will result in slowing down exploratory and development work, particularly in new areas like New Mexico that might develop substantial additions to the gas supply.

Other fears.—Another angle that is viewed with concern is the possible effect of the situation on operators seeking bank loans to finance development, which might go so far as to force some to seek a status determination from the commission. This was explained in this way: If an operator went to a bank for a loan, showing that he had or could have contracts for the sale of gas at a certain price, the bank might want to be sure that his price would meet with FPC approval and, lacking that approval, might be reluctant to advance money or demand that the FPC okay the price before the loan was closed.

From the standpoint of the oil industry, however, the big point is how the commission would treat the gas of operators who primarily are oil producers. These operators are fearful that FPC control of gas would extend also to their oil operations, although the commission has said it has no authority over oil and has not sought it.

But even if the commission did not take oil operations into consideration, it would be faced with the job of deciding how much of the investment, development expense and other costs of oil-gas production should be applied to the gas.

It has been complained that the commission, in fixing gas prices for companies that have both jurisdictional and nonjurisdictional (industrial) sales, how assigned a preponderant share of costs to the latter, thereby reducing the base on which a gas price is fixed, and it is feared that, similarly, in the case of oil-gas production, as much as possible of the costs would be assigned to oil, thereby reducing the price for which an operator could sell his gas.

FPC huddle.—The Federal Power commissioners are understood to have had several meetings to consider their course but have arrived at no conclusions so far. There have been suggestions that any extension of control to producers would be held up until the Phillips case is disposed of, either by an order holding Phillips not to be a natural gas company or court decision on an appeal from an order to the contrary or, alternatively, the commission will wait until the furor of the present situation has died down and its effect on prices can be more definitely determined, in line with the President's statement in his veto message that it was to be expected that the process of price adjustment will probably continue and called for control only to keep it within "reasonable limits."

Legislative outlook.—Meanwhile, there are no indications that any further attempt to deal with the situation by legislation will be made during this session of Congress, and several industry spokesmen said they did not know what could be done along that line in view of the President's position.

Most likely, they said, the activities of the FPC will be closely watched with a view to making a new drive in the event they threaten further harm to the producers.

Publicity campaign.—But most important, it was said in some quarters, was the making of a real publicity campaign to acquaint the public with the natural-gas situation, along the lines that are being followed by the oil industry.

Had they been fully acquainted with the facts, it was asserted, many cities that put up a fight against the Kerr-Thomas bill would not have done so. St. Louis, for instance, whose natural-gas supply is protected by contracts with many years to run and which would not have suffered any increase in cost by reason of the legislation.

Many cities, it is contended, would have benefited by the bill, which would have brought on to the market large volumes of gas now being withheld, with producers competing for markets rather than pipe lines competing for supply and forced by that competition to keep their prices at a reasonable level.

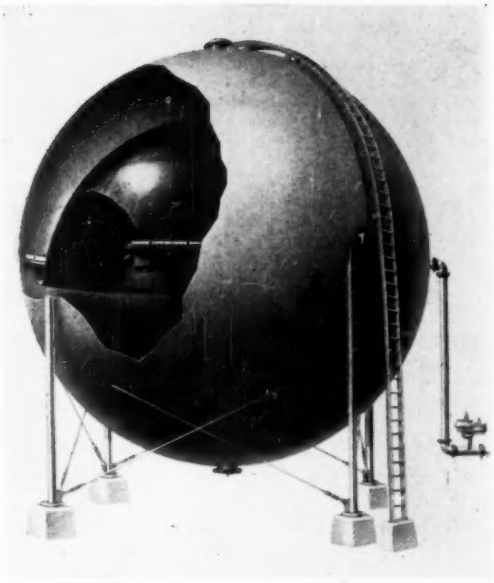
New Tanker Policy

WASHINGTON.—The Navy Department is preparing to inactivate 8 of its commercial type tankers and will substitute privately owned tankers under charter, it has been disclosed by Assistant Secretary John T. Koehler.

With only 29 of its presently commissioned tankers capable of maintaining a 19-knot speed and no comparable oil vessels in the mer-

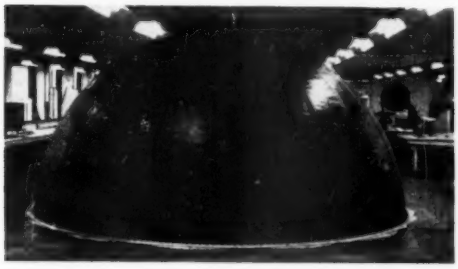
the VAPORSPHERE*

prevents evaporation losses from fixed-roof tanks storing crude oil or gasoline



The Vaporsphere is a spherical steel shell with a flexible, hemispherical membrane on the inside. The edge of this membrane is fastened to the shell at the equator.

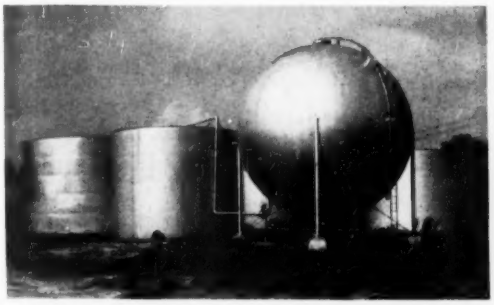
The Vaporsphere serves as the "heart" of a vapor-saving system by providing temporary storage for vapors which are forced out of the storage tanks to which it is connected. When vapor is displaced from the tanks by breathing or unbalanced filling, it flows into the Vaporsphere through large-diameter vapor lines. The membrane billows upward to provide the additional capacity required. When the atmospheric temperature drops or liquid is withdrawn from the tanks, the vapor flows back into the tank and the membrane travels back down. Vapor does not escape from the system as a result of breathing, *hence there is no breathing loss.*



CHI-LON* Flexible Membrane

The flexible membrane in a Vaporsphere is made of CHI-LON*. This material has excellent resistance to attack by petroleum vapors and is strong and durable. CHI-LON* is made of Buna-N rubber reinforced by nylon cloth. The view above shows a membrane inflated for testing before shipment.

***Trademark**



Typical Vapor-Saving System Incorporating a Vaporsphere and Four Cone-Roof Tanks

This view of the Yankeetown, Fla., marketing terminal of the Citizens Oil Co. of Yankeetown, Inc. shows a vapor-saving system consisting of a 10,000 cu. ft. Vaporsphere and four cone-roof storage tanks. There are three 109,000-gal. and one 382,000-gal. tanks in this system. The vapor spaces of all four tanks are connected to the Vaporsphere by large-diameter, lightweight piping.

Vapor displaced from the tanks by daily breathing or unbalanced filling flows thru the lines into the Vaporsphere. It returns to the tanks when the conditions which caused displacement are reversed. Thus, there are no breathing losses and filling losses may be substantially reduced.

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Atlanta, 3.....2154 Healey Bldg.
Birmingham, 1.....1536 North 50th St.
Boston, 10.....1025—201 Devonshire St.
Chicago, 4.....2128 McCormick Bldg.
Cleveland, 15.....2264 Guildhall Bldg.
Detroit, 26.....1514 Lafayette Bldg.
Havana.....402 Abreu Bldg.
Houston, 2.....2119 National Standard Bldg.
Los Angeles, 17.....1523 General Petroleum Bldg.
New York, 6.....3347—165 Broadway Bldg.
Philadelphia, 3.....1615-1700 Walnut Street Bldg.
Salt Lake City, 4.....525 West 17th South St.
San Francisco, 11.....1254—22 Battery Street Bldg.
Seattle, 1.....1325 Henry Bldg.
Tulsa, 3.....1606 Hunt Bldg.

REPRESENTATIVES AND LICENSEES

Horton Steel Works, Limited, Fort Erie, Ontario, Canada
Ateliers et Chantiers de la Seine Maritime, Paris, France
Constructions Metalliques de Provence, Arles-sur-Rhone, France
Chicago Bridge & Iron Company, Ltd., Apartado 1348, Caracas, Venezuela
Compagnia Tecnica Industrie Petroli, Rome, Italy
Whessoe, Limited, Darlington, England
Motherwell Bridge & Engineering Company, Limited, Motherwell, Scotland
Comprimo N.V., Amsterdam—O, Netherlands

chant fleet, Navy officials are giving serious study to the possibility of making long-term charters to private owners who would undertake to build such vessels, Koehler indicated.

The Navy is firmly in favor of a strong merchant marine as an auxiliary of the armed services, as well as a healthy shipbuilding and ship-repair industry.

An adequate tanker fleet is a vital necessity, Navy officials said, pointing out incidentally that during the last war more uncrated aircraft were carried overseas by tankers than by any other means.

Imports Study Asked

Chapman asks NPC to recommend action; council rejects all-energy survey, hears review of sterling situation

WASHINGTON. — Secretary of the Interior Oscar L. Chapman asked the National Petroleum Council last week to make a further study of the import problem and submit definite recommendations for dealing with it, expanding the request made by the department last October for a factual review of the situation.

In a letter to Chairman Walter S. Hallanan and in a personal appearance before the council, Chapman indicated that he is seriously concerned over current conditions and the continuing high level of imports and would welcome suggestions.

At the same time, Hugh A. Stewart, director of the Oil and Gas Division, who also discussed the matter, expressed the view that if the British controversy could be satisfactorily settled, the import problem might take care of itself since aboveground crude inventories are low and increases in production are indicated.

Synthetics criticism asked.—At the same time, Chapman threw the Bureau of Mines' synthetic-liquid-fuels development open to industry criticism, asking the council to set up a committee to review the bureau's estimates on the cost of producing such fuels and on comparative costs of fuels from petroleum, prepare independent cost estimates, and make recommendations as to how future bureau estimates might be improved.

The bureau's experimental work, Chapman said, now is sufficiently advanced to enable it to furnish some of the data required on cost and engineering of developing a synthetic-fuels industry, but is expected to ask for more funds with which to continue its work, for which $60,000,000 already has been appropriated by Congress.

Both of the department's requests were received too late for consideration and action by the agenda committee in advance of the council's spring meeting, and it was decided that Chairman A. Jacobsen should poll his committee and report to Hallanan, who then could instruct the committee on imports and set up a new committee for the synthetic-fuels study if, as expected, the requests for the studies are approved.

Energy study rejected.—The only other definite action at the April 26 session was rejection of a department request for a committee study of supplies and requirements of all sources of energy—oil, gas, coal and electric power.

Recommending against such a study, the agenda committee pointed out that not only would it involve manufactured gas, coal, and power, the products of competing industries upon which the council is not fully informed, but would necessarily involve the effect of price and so would be outside the proper scope of the council's activities both from the organizational and legal standpoint.

Following discussion by Secretary Chapman, however, it was agreed that the council might give advice with respect to the situation in oil and natural gas, but no formal action was taken pending a specific request from the department.

The only report to be submitted to the council was an incomplete report from the committee on liquefied petroleum gas, one section of which gave rise to controversy among council members. The report was returned to the committee for further consideration. The military oil situation was discussed by Bruce K. Brown of the military petroleum advisory board, but no formal report was released.

Sterling-problem review.—A review of the dollar-sterling oil controversy, currently the subject of discussions in London on the basis of the State Department's proposals of last month, was given by Robert H. S. Eakens, chief of the State Department petroleum policy staff.

Eakens told the council they would enable the British to save substantially the same amount of dollars that they would save by substituting British for American oil and at the same time protect the position of the American companies operating in sterling and "third country" areas.

"It is highly important that an agreed solution to the problem be found," Eakens declared. "It is also important that the dollar gap problem

NEW OIL NAME.—What last week was Stanolind Pipe Line Co. this week is Service Pipe Line Co. Here J. L. Burke, company president, looks at the new emblem as it hangs on a map of the pipe-line system in the company's Tulsa headquarters. Burke said the new name, which became effective May 1, was adopted to eliminate confusion resulting from the existence of several companies bearing the Stanolind name. The Service system operates in 10 states and has a capacity of 400,000 bbl. daily. Oil from 27,000 wells moves through the system to, via the system and connecting carriers, 37 refineries.

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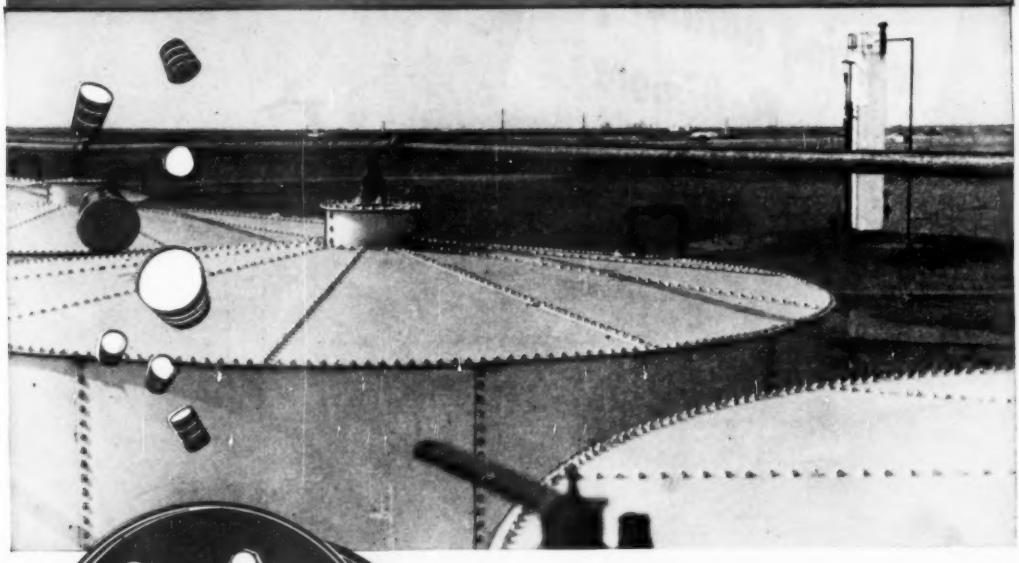

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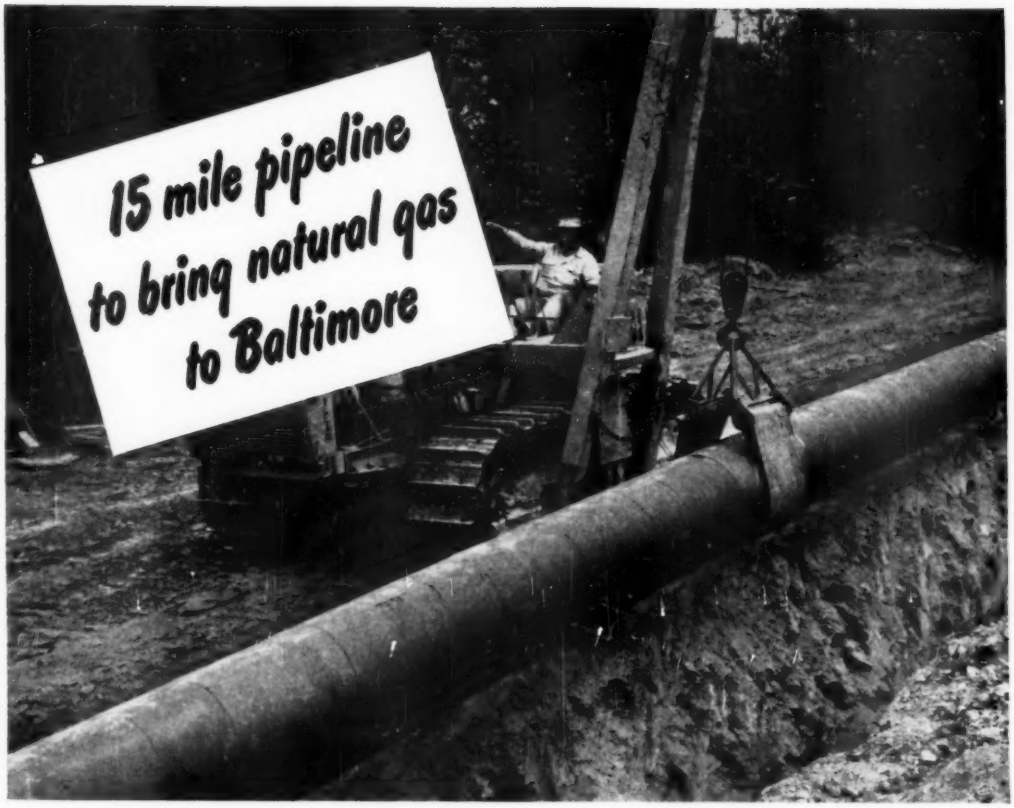

After tar-enameling and wrapping, Bethlehem 26 in. gas pipe is lowered into ditch.

To provide the Baltimore area with natural gas, the Consolidated Gas Electric Light & Power Company of Baltimore recently constructed a 15-mile steel pipeline, with seven lateral interconnections, from the Atlantic Seaboard Corporation's transmission main near Granite, Md., to the Spring Gardens gas manufacturing plant in Baltimore.

The 3065 tons of welded steel pipe for this line was fabricated by Bethlehem. The pipe was 26 in. in diameter and ¼ in. thick, and was supplied in 40-ft lengths, each length having beveled ends for field-welded girth seams. Final testing of the line is expected to be completed in time for full-scale operation by mid-summer.

Truckload of Bethlehem gas pipe being stenciled, prior to shipment to job site.

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On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

FABRICATED STEEL CONSTRUCTION

BETHLEHEM STEEL

WATCHING WASHINGTON

Bertram F. Linz

Three Problems

The United States Chamber of Commerce met this week for its annual look at the national situation and found that pensions, transportation, and public power are the three big problems confronting the industry.

In the field of pensions the major questions are their cost and the tax angle, but in transportation the chamber wanted to know whether our transport system is being weakened or strengthened by governmental aid and whether government is invading the field of management to the detriment of a sound transportation system.

The question of public power was canvassed exhaustively since there are many who see in the government efforts in that direction the seeds of a possible domination of other industries which are of equal "public interest" importance to the people, such as coal, oil, natural gas, and steel.

M-Day Plans

With W. Stuart Symington, former Secretary of the Air Force, in the driver's seat as chairman, the National Security Resources Board will go all-out on development of a program for mobilization of the oil and other industries in the event of war.

Symington last week took over the chairmanship of the board, which has been vacant for some 18 months since the resignation of Arthur M. Hill. Since early December, 1948, such leadership as the board has had has come from Dr. John R. Steelman, presidential assistant, as acting chairman.

Reportedly, President Truman wants Symington to develop the national mobilization plan which the board was set up to draft. A couple of years ago the board did come up with the basic ideas for a 20-chapter measure which, when perfected, was to be enacted by Congress and put on ice until needed, but it never developed the finished product.

For a year and a half the board has been pretty much marking time on the problem of mobilization, but has continued a number of studies of individual industries and public services such as shipping, railroads, and the like. There has been a contraction rather than expansion of the staff during that period, but now it is expected Symington will build it up quickly, possibly giving Charles B. Rayner, chief petroleum adviser who now has only one assistant, one or two additional experts and instructions to whip into shape such special provisions for mobilization of the oil industry as may have to be incorporated in the general plan.

It is generally expected that the program for mobilization will be made public, part by part, as it is developed, thus giving industry advance knowledge of what will be required of it in the event of war and an opportunity to work out its own plans for meeting its responsibilities.

The administration plan for dealing with mobilization is still what it was originally—to draft and enact now all of the measures required to give the President authority to order the controls which Congress imposed piecemeal during the last war, thus avoiding the confusion which resulted from the so-called "gradual" approach to national regimentation, but providing that none of the measures authorized may be put into effect unless and until Congress gives the word.

Oil on the Water

Secretary of Commerce Charles Sawyer polished up his crystal ball recently and came up with a prediction that the proposed $800,000,000 development of the St. Lawrence waterway would result in an oil movement of from 6 to 20 million tons a year.

The project, which would provide a waterway from the Atlantic to the Great Lakes, has been envisioned for decades and has been a perennial subject of discussion in Congress, which so far hasn't done anything about it and won't do anything this year.

Painting a picture of the 80 to 90 million tons a year traffic which he said would be developed, Sawyer admitted that at this time it is impossible to predict with any assurance the timing, direction, or the volume of petroleum movement.

It might come from the Gulf states, Venezuela, or the Middle East, he told a House committee, but it might run the other way, from the Alberta development to eastern Canada.

Sawyer said his predictions as to oil movement were based on the experience with other major waterways that have been developed, almost all of which have a heavy petroleum traffic not be enlarged in the process. Unless this larger problem can be solved the prospects of lessening the restrictions against dollar oil and other dollar products, and solving on any permanent basis such problems as the one I have been discussing, are exceedingly doubtful."

Eakens said the United States Government is seriously concerned not only regarding the current displacement of American oil but also in regard to the possibility of continuing and increasing displacement.

Canadian worries.—Discussion of the import situation developed that concern is beginning to be felt over recent statements that Canadian oil should be welcomed in this country.

Disclosing, but not identifying the source of such statements, E. E. Pyles of the Jergins Oil Co., Long Beach, Calif., said producers are worried about a possible flood of Canadian oil as a result of the recent development of production.

Plea for OGD

Hallanan tells committee work is vital to nation

WASHINGTON.—Challenging the assertion of the House appropriations committee that there is no longer a need for the Oil and Gas Division, National Petroleum Council Chairman Walter S. Hallanan is making a vigorous fight to have the Senate restore funds for continuance of the OGD which were cut out of the omnibus appropriation bill by the House group.

Testifying before a Senate appropriations subcommittee, Hallanan warned that elimination of the OGD, which would carry with it elimination of the council, might seriously affect the national security, which is directly tied to petroleum.

Security, he told the subcommittee, depends on a strong domestic oil industry, and the oil economy of the nation is acutely sensitive to governmental interference with a free market which provides a necessary incentive for exploration, increased efficiency, and technological improvement.

Planning for emergency.—"It is impossible at this time to evaluate, except in general terms, the problems of an unknown future," Hallanan asserted. "Attempts to anticipate all the needs of a protracted war would tend to establish rigid patterns which could seriously affect the economy and strength of the nation. Wise policies and appropriate actions must evolve out of constant study of changing factors.

"The soundest procedure is to direct studies principally to the immediate and short-term requirements of an emergency. The existing Oil and Gas

Division, the National Petroleum Council, and the Military Petroleum Advisory Board should continue to function. Elimination or curtailment of their functions would imperil the national security."

Outlining the cooperative efforts of the OGD and NPC, Hallanan said that after 4 years of the experiment he is distinctly proud of the record achieved.

Teamwork needed.—"With the many critical problems we are facing today on every front and affecting every segment of the petroleum industry, I think we can all agree that at no previous time has there been more real need for sincere and high-minded teamwork and cooperative effort.

"At a time when the strengthening of our national defense and the protection of our national security is the No. 1 major problem facing Congress, I urge the vital importance of the continuance of the cooperative working arrangement between the petroleum industry and the Oil and Gas Division.

"At a time when billions are being spent for national defense, it would seem to be poor economy to break up this vital link in the chain of our over-all defense program."

Imports Action Near?

WASHINGTON. — Reports were current here this week that President Truman believes the time has come when something should be done about oil imports and is about to do it.

Members of Congress who have visited the White House to ask that something be done to limit the flow of foreign oil are apparently convinced the President will act promptly, although they do not appear to know just what he will do.

They point out that the oil situation is not one in which foreign countries are seeking desperately needed dollar exchange nor one which is involved in the reciprocal-trade program. They say the President can act without in any way infringing upon the administration's foreign-aid or trade policies.

There is much speculation as to what the President may do, but in some quarters it is believed he may ask Secretary of the Interior Oscar L. Chapman to make recommendations for legislation. This is given support by the fact that in his letter to Chairman Walter S. Hallanan last month Chapman asked for recommendations by the National Petroleum Council, going much further than his original request for factual findings, a possible indication that the matter had been discussed at the White House before the letter was written.

Generally, such action by the President would be viewed as notice to importing companies to curb their imports "or else," since it is not believed Congress would or could enact legislation on the subject in the short time of the current session which now remains.

But a request to Chapman to recommend legislation and its submission to Congress would be a quicker procedure than having the Tariff Commission make an investigation, which probably would require several months to complete.

Loan Extension

Texmass given extra month to meet FPC requirements

Bertram F. Linz

WASHINGTON. — Another 30-day extension was granted Texmass Petroleum Co. last week by the Reconstruction Finance Corp. to meet the requirements of the contract under which it is to get at $10,100,000 government loan.

Although officials of the RFC Dallas office said earlier last month they were working "day and night" to complete the details, it was said the paper work could not be finished by the April 27 deadline on which Texmass officials had hoped to begin drawing on the loan.

Announcement of the extension came on the heels of a "statement of conclusions" unanimously approved by the Senate banking subcommittee which has been investigating the loan, branding it "not justified" and charging that directors of the RFC "gave only casual and superficial consideration and study" to it.

Subcommittee statement.—The statement was approved by all members of the subcommittee, including two who had not attended any of the hearing sessions.

The subcommittee said that the two RFC directors who approved the loan "disclosed inadequate knowledge of the significant facts and features" and "overruled the findings and recommendations of their own review committee without persuasive evidence justifying such action."

On the basis of its evidence, the subcommittee said, "it appears that the primary consideration in the Texmass Petroleum Co. loan is not the interest of the general public. On the contrary, it is primarily a 'bail out' of existing creditors of the borrower. Eighty-one per cent of the loan funds will go to insurance companies, banks, other creditors, and individual investors, minimizing their risk of loss in a highly speculative venture."

It further charged that the RFC had not made an affirmative showing that the loan was qualified under laws governing the agency "to the extent necessary to justify disbursement of public funds"; had not established that financing for Texmass is not otherwise available on reasonable terms; and had not shown that the loan was of such sound value or so secured as reasonably to assure retirement or repayment.

RFC to reply.—Officials of the RFC Dallas office and Texmass were called to Washington last week to discuss a phase of the loan involving properties owned by Swiss Oil Co., which is to be absorbed by Texmass, and the Senate subcommittee plans to hold another hearing this week at which RFC officials will reply to criticism of their actions.

The subcommittee actually is investigating the RFC rather than Texmass, and that loan happened to be the best available as a possible means of attacking the five directors whose terms expire June 30.

Refining Dividends Up

WASHINGTON.—Publicly reported dividends of oil-refining corporations during the first quarter of this year were some 40 per cent higher than for the same period in 1949, the office of business economics of the Department of Commerce reported last week.

The refining corporations paid dividends of $153,200,000 during the quarter compared with $110,500,000 in the same period last year, the department announced, an increase that was not even approached by any other branch of corporate activity.

Publicly reported dividends of the companies for March alone were $117,900,000, against $75,700,000 in March, 1949, and accounted for more than 25 per cent of the total of dividends announced publicly by all manufacturing corporations.

MID-CONTINENT

Oklahoma Output Unchanged

OKLAHOMA CITY.—Crude production allowable will remain unchanged in Oklahoma during May.

Set at 447,628 bbl. daily, it compares with current production of 435,700 bbl. per day. Purchasers nominations for May call for 448,958 bbl. daily.

Minor changes were made in pool allocations, with 11 fields being added to the allocated list. Per-well allowables remain the same.

Kansas Allowable Up

WICHITA.—Kansas' allowable for May has been increased by 10,000 bbl. over April to 285,000 bbl. daily.

In asking for the new figure, T. A. Morgan, conservation director, noted the increased demand for crude to meet expanded needs of Kansas refineries and the improvement in the balance between stocks and crude demand.

Morgan listed purchaser nominations for May at 295,680 bbl. per day, compared to 287,383 in April.

EASTERN

Doubled Capacity

Perth Amboy refinery soon to handle 50,000 bbl. daily

George Weber

CONSTRUCTION is now under way on an extensive refinery expansion and modernization program by California Refining Co. at Perth Amboy, N. J.

Crude capacity of the 25,000-bbl. per day plant will be doubled, and operations will be extended by the addition of catalytic cracking, thermal reforming, alkylation, and treating facilities.

Two identical 12,500-bbl., two-stage atmospheric and vacuum crude units will be added to bring total processing capacity to 50,000 bbl. daily. The first catalytic cracking facilities to be installed at the refinery will comprise two twin Houdriflow units, each rated at a feed capacity of 12,500 bbl. per day.

An existing 6,000-bbl. combination thermal cracking unit which includes 2,000 bbl. in reforming capacity, will be augmented by construction of a new thermal reformer rated at 10,000 bbl. per day of fresh feed.

The first new alkylation facilities to be constructed in this country since the end of the war will further add to flexibility of the newly modernized plant. The cold sulfuric acid alkylation unit will be rated at a feed charge capacity of about 5,000 bbl. daily, and alkylate will be used in blending to motor fuel. New lead sulfide treating facilities are also being added to the processing section of the refinery.

Clearing and grading of the new process area began late last year and installation of new tankage and lines continued through the winter. Actual construction of process units started in March. The entire construction project is scheduled for completion by the end of this year, or in early 1951.

California Refining Co., a subsidiary of Standard Oil Co. of California, purchased the Perth Amboy refinery from Barber Asphalt Co. in the summer of 1946. The plant's crude capacity at that time was between 10,000 and 15,000 bbl. daily. Since 1946, capacity of the existing plant has been raised to 25,000 bbl. daily by means of a series of bottleneck removals and installation of minor items of auxiliary equipment.

Under present plans, the refinery will continue to operate on Gulf Coast and Venezuelan crudes. All new processing units are designed to handle sour stocks. Asphalt manufacture will continue. New asphalt blending and shipping facilities were completed in April.

C. F. Braun & Co. has the contract for the new crude units, the catalytic cracking units, the thermal reformer and the new power plant. Design and construction of the alkylation unit is contracted by M. W. Kellogg Co. Catalytic Construction Co. is contractor for the new lead sulfide treating plant.

Platforming Unit Planned

BRADFORD, Pa.—Kendall Refining Co. announced this week it will construct a 1,500-bbl. Platforming unit at the company refinery here.

Universal Oil Products Co. will erect the unit, similar to that of Old Dutch Refining Co., at present the only one of its kind in operation.

Construction is scheduled to begin in the near future, with initial operation expected by autumn. Kendall plans to Platform naphthas and straightrun gasoline.

Penn Grade Price Raised

Continued withdrawals from Pennsylvania Grade crude-oil inventories has resulted in a price increase of 11 cents a barrel.

The Joseph Seep Purchasing Agency of South Penn Oil Co., announced the increase for various grades effective May 1. Under the new posting, the company will pay $3.65 for Bradford-Allegany crudes and $3.22 for crudes from southwestern Pennsylvania districts. Pennsylvania Grade crudes delivered to Eureka Pipe Line Co. and Buckeye Pipe Line Co. are listed at $3.16 on the new schedule.

No change was made in price of Corning crude, still posted at $2.70 a barrel.

This is the second increase for Pennsylvania Grade in the past 5 months. The last raise was for 14 cents a barrel, effective December 12 of last year.

GULF COAST

Recovery Study

Advisory group asks survey of all Louisiana oil fields

Leigh S. McCaslin, Jr.

BATON ROUGE.—A statewide survey of secondary-recovery possibilities was recommended last week by the Louisiana Secondary Recovery Advisory Committee at its second meeting.

The recommendation was made contingent upon approval by Conservation Commissioner S. L. Digby and operation of the survey by the state university or other schools. At the same meeting reports were received on the secondary-recovery possibilities of four Louisiana fields—Shreveport, Caddo-Pine, Rodessa, and Ashland.

A committee headed by W. C. Fullilove of Allison Drilling Co. reported that it is not considered economically advisable to attempt any secondary-recovery methods in Shreveport field. The field has an effective natural water drive, which influenced the decision, the committee said. Total production to date is two and a half times that originally calculated using gas expansion alone as the controlling factor.

The committee for the Caddo-Pine field headed by J. A. Walker, Magnolia Petroleum Co., reported that it had no recommendations to offer at this time. The committee could come to no conclusions because of the absence of data on reservoir characteristics, past production, and detailed history of the area. Caddo field is the oldest oil field in the state of Louisiana, having been discovered in 1904.

Three reservoirs were discussed in the report submitted by the Rodessa field committee, headed by R. O. Garrett, Arkansas Louisiana Gas Co. It was concluded that further study is necessary for the Dees-Young zone, which is the principal oil producing horizon in Rodessa field. It was decided that secondary recovery is impractical for the Neugent sandstone and the Hill sand.

It was decided by a committee headed by Robert B. Cater, Jr., Atlantic Refining Co., that secondary recovery was not feasible for Ashland field.

Rob Roy, of R. O. Roy & Co., asked that the committee study the Creighton-Naborton area as to secondary-recovery possibilities.

Raymond B. Hamilton is head of the Louisiana Secondary Recovery Advisory Committee.

Crude Cut in Mississippi

HOUSTON.—Gulf Refining Co. this week reduced by 30 cents a barrel its posted price for crude from Baxterville field of Mississippi. At the same time, the company said it will double its runs from the field. The price cut is from $1.45 to $1.15 per barrel.

Now buying about 6,000 bbl. a day from the field, Gulf maintained that the heavy, low-gravity crude had been "overpriced at the well."

LATIN AMERICA

De Mares Arrangement

Private Colombian capital to hold 55 per cent interest in Tropical concession; government must help control labor

Dahl M. Duff

A MIXED company, 55 per cent controlled by private Colombian capital and the remaining interest held by the government, is now slated to be the instrument for operation of De Mares concession after August 25, 1951.

As provided in the original contract, the 1,265,000-acre concession in the central Magdalena Valley together with all its fixed property will revert to the Colombian Government at the end of its 30-year term in 1951.

For months, the question of how to operate this going oil property of Tropical Oil Co. has been the subject of public and private debate in Colombia. In December 1948 the Congrss authorized a semiofficial oil enterprise to take over De Mares. It defined three classes of stockholders—government, private Colombian interests, and foreign capital—and provided the first two groups would be in majority control.

Hopes that Tropical would continue in the operation as a minority partner with the government were dissipated late last year when company officials notified the government that it was not interested. Tropical is an affiliate of Standard Oil Co. (N.J.) through International Petroleum Co., Ltd.

With this development, the government pursued discussions with the private Colombian interests. It was recently disclosed in Bogota that Colombian capital, through the national manufacturers association, ANDI, had agreed with the government on the terms for the private Colombian participation.

Hard bargain.—These terms, it is felt, show that the private Colombian group drove a hard bargain with the government. Besides having 55 per cent control, they will, under the agreement, name the manager for the operation. Furthermore, the government has given assurances that the existing 10 per cent royalty will not be increased as originally planned.

The over-all agreement has the approval of the president and the cabinet, according to Bogota reports, and Cipriano Restrepo, retired Colombian capitalist, has been placed in charge of the organization of the company, which will be known as Empresa Nacional de Petroleos. Individual subscription of stock in the enterprise is to be placed on the basis of a patriotic duty.

The preliminary agreement between ANDI and the government also stipulates that the concession will be turned over free of social problems relating to the existing labor force and that the problem of the squatters now on the concession will be solved by the government.

Initial capital is placed at Ps 30,000,000 ($15,000,000). The plans call for modernization of the Barranca-Bermeja topping plant, which is among the property to revert, construction of a new coastal refinery probably at Cartagena, and construction of various pipe lines to improve products distribution in the country.

Officials of the government are said to be now reconciled to the fact that it is unlikely any major foreign oil company will participate in the De Mares enterprise on the conditions given. The private Colombian capitalists, for their part, though realizing the importance of De Mares as the major source of Colombian production and refining, asked for and obtained definite commitments against majority government control.

Marketing plans.—Even after relinquishing De Mares, Tropical will continue as the major marketing organization in the country. It also has some exploration interests outside De Mares, though no other production. Its distribution system alone at the end of 1948 was estimated to be worth nearly $18,000,000, including river boats, terminals, and filling stations.

Who will market the products from the projected part-government company is not determined, though presumably an agreement will be sought with Tropical.

Operations.—De Mares production in February was approximately 31,000 bbl. daily, about 42.5 per cent of the Colombian total. Further drilling in the field has been discontinued. The value of the concession property that reverts has been estimated at about $30,000,000, not including oil reserves. The government and Tropical under an agreement worked out last year are gradually substituting Colombian nationals in supervisory positions in preparation for the reversion date.

One of the most difficult problems connected with De Mares has been that of the squatters. Many of them moved into the area on the strength of rumors such as that they would be able to take possession of an oil well when the concession expired. It is estimated there are now some 3,000 squatter families which will have to be taken care of by the government.

Colombian law gives these people certain property rights and what they have developed must be appraised and paid for. The law requires that they stay 500 m. away from any oil installation but this has not been observed.

Pilfering of company property became a problem after the influx of squatters increased. Such items as pumping rods and even a motor disappeared. Company gas lines were tapped for cooking and heating, and the company railroad from Barranca to El Centro was used.

The squatters bartered with regular company employes for commissary coupons, and the company found its outlay for subsidizing food costs considerably increased. They gained service in the company hospital, and have even organized a syndicate to press for protection of their position with the government.

New Refineries

One Puerto La Cruz plant operating, other advanced

A NEW 30,000-bbl. daily refinery has gone into limited initial operation at Puerto La Cruz, Venezuela, and construction work is moving ahead on a second plant being built at this eastern Caribbean port.

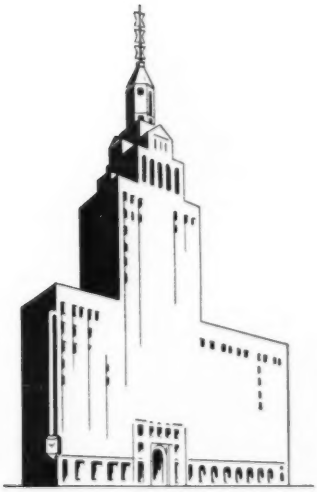
Now on stream is the newly completed refinery of Venezuelan Gulf Refining Co. *(The Oil and Gas Journal, April 27, page 85.)* Present operations are understood to be in the nature of testing, and full throughput is not expected to be reached for about a month. This refinery includes a Polyform unit.

The refinery still under construction at Puerto La Cruz is that of Venezuelan Petroleum Co. (Sinclair). Both Puerto La Cruz refineries are projects undertaken under the Venezuelan Government's 1943 oil-law requirement that 10 per cent of production from new concessions be refined in the country.

The recent report of Venezuelan Petroleum noted that its Puerto La Cruz refinery, being built by the subsidiary Sinclair Oil & Refining Co., was 35 per cent completed at the beginning of the year and that it would be finished on or before the agreed date of December 31, 1950, barring unforeseen contingencies. It gave estimated total cost of the plant as $20,000,000. Original plans called for a 35,000-bbl.-daily refinery.

The Venezuelan Petroleum report

Make it a Paying Proposition With NBT Oil Financing



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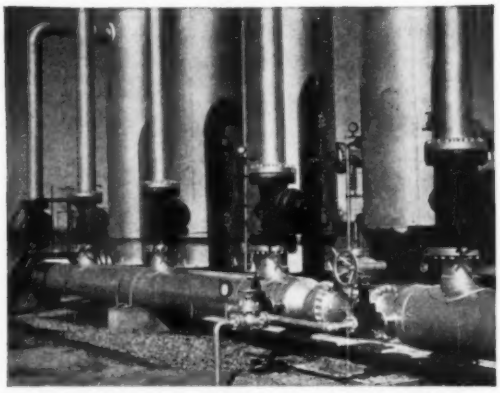
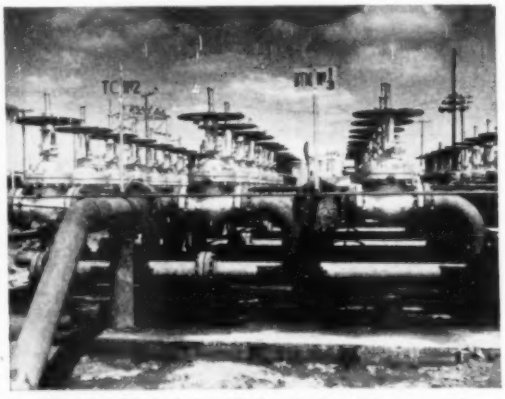
WALWORTH PIPE LINE VALVES...



Walworth 12-inch, steel, Lubricated Plug Valves on scrubbers in blower station yard of a southwestern pipe line company.



Walworth 8-inch, Series 600 Cast Steel, outside screw and yoke type, Pipe Line Gate Valves with stem protectors.

Walworth 26-inch, Series 600 Cast Steel, Pipe Line Valve with double handwheel operator in a South American pipe line.

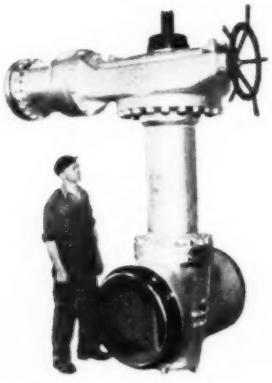
Walworth makes BOTH gate valves and lubricated plug valves for pipe line service

Walworth Pipe Line Valves are handling crude oil, fuel oil, gas, gasoline, and allied products in many of the most important pipe lines of the world. Their design is the result of years of experience in the production of valves to meet the particular requirements faced by the Oil and Gas Industry, in the distribution of its products through pipe lines.

Walworth Cast Steel Pipe Line Gate Valves and Cast Steel Horizontal Check Valves are accurately machined to close tolerances. They are produced for maximum cold working pressure, and have face-to-face and other dimensions in accordance with the current API standards. Discs of both Gate Valves and Check Valves open completely out of the passageway, allowing an unobstructed passage for scrapers or other tools.

Walworth Lubricated Plug Valves, because of the many advantages peculiar to the design of this type of valve, have gained wide acceptance in pipe line service, particularly on lines carrying natural or artificial gas and finished petroleum products.

Full information furnished upon request.



A Walworth 26 x 24-inch Lubricated Plug Valve for 960 pounds working pressure, with a high pressure cylinder for use in conjunction with automatic valve control. Built for natural gas pipe line service.

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DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

expressed some apprehension over outlets for the products in view of changed conditions in the industry in the last 2 years. "Under conditions prevailing in 1945 when the refinery agreement was made, all of the prospective refined products could have been disposed of readily," it said.

"At this time, however, Venezuela has lost a part of the South American market and its market in Europe has been reduced by reason of the exclusion of dollar oil from sterling areas and by the refining of crude oil from the Middle East in the rehabilitated and new refineries of Europe. Refineries in Venezuela with long-established foreign outlets are finding it increasingly difficult to market their products. The management has been endeavoring to establish outlets for the products from the refinery when completed, and will continue to make every effort to do so."

The Gulf-Texas and the Sinclair refineries at Puerto La Cruz will be the third and fourth new plants completed in Venezuela since the war.

The first was the Cardon refinery of the Shell organization which went on stream last spring and which is reported to be now making further extensions. The Amuay Bay refinery of Creole Petroleum Corp. was opened in January, and a long-distance steel-pipe water line is now being completed from the mainland to Paraguana Peninsula to supply water to both the Shell and Creole installations.

Refining Decision

Imports of crude again to be permitted in Argentina

AMERICAN oil companies with refining and marketing interests in Argentina have reached an agreement with the Argentine Government for the importation of necessary crude oil over a 1-year period.

The companies affected are the Argentine affiliates of Standard Oil Co. (N. J.), and Ultramar, S.A., Petrolera Argentina, jointly owned by Socony-Vacuum Oil Co., Inc., and The Texas Co.

The arrangement will allow resumption of operations at the 6,000-bbl.-daily Ultramar plant near Buenos Aires which was shut down late in January after Argentine authorities failed to grant necessary dollar allocations for the purchase of suitable crude oil.

Ramon A. Cereija, Argentine minister of finance and commerce, confirmed the agreement last week in Washington. This official is now in the United States in connection with Argentine trade policy.

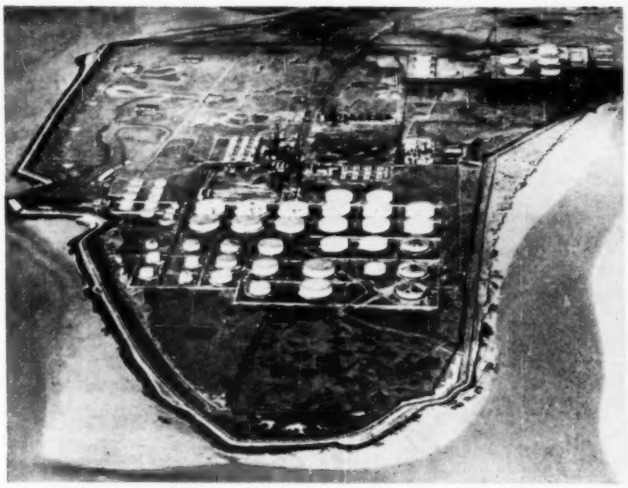
The oil agreement considerably brightens the outlook for continued American oil operations in the South American republic. It apparently came as a part of the generally improved relations between the United States and Argentina leading to a new commercial treaty between the two countries.

The position of the American companies had become increasingly difficult in Argentina in the face of expansion of the integrated government oil operation, Yacimientos Petroliferos Fiscales, and last year's bilateral agreement with the British Government providing a virtual barter arrangement with British oil and Argentine meat. Y.P.F. supplied the Ultramar outlets when that plant closed, and these presumably will be returned with the resumption of operations in the near future.

Jersey Standard has four refineries in Argentina, two operated by Standard Oil Co., S.A., Argentina, and two by Cia. Nativa de Petroleos, S.A. The principal plant is at Campana and combined capacity of the refineries is about 22,000 bbl. daily. Since the British - Argentine agreement, operations have been continued by obtaining sour crude from sterling sources.

The Ultramar refinery is equipped to process only sweet crude. Its lubricating-oil production normally meets about a fifth of the requirements of the Argentine market. It ceased operations when proper crude was not made available, and it is understood that the outlook for further supply of crude for the Jersey refineries had become highly uncertain.

The exact amounts of dollar oil which the American companies can import under the new agreement is not known, though it is reported that some 20,000 bbl. daily has been provided for the Jersey Standard plants. The term of the agreement is a year, and the companies are said to be



REFINERY SITE.—This is the 1,380-acre site on the Thames River in England where Socony-Vacuum Oil Co., Inc., has announced it will build a 20,000-bbl. refinery in partnership with Powell Duffryn, Ltd., a British firm. The site is at Coryton about 25 miles below London Bridge on the north bank of the river. Here Powell Duffryn's subsidiary, Cory Brothers & Co., Ltd., now operates an oil blending, treating, and storage plant. Vacuum Oil Co., Ltd., Socony-Vacuum's British subsidiary, and Cory Brothers are to be merged with the equity capital held equally by the parent American and British companies. (The Oil and Gas Journal, March 30, page 73.) The new plant, though specializing in lubricating oils, will be a complete refinery. It is reported the project will not involve ECA funds or guarantees. Capacity of Cory Brothers' present facilities at Coryton is about 4,000 bbl. daily. Present storage at Coryton approximates 2,100,000 bbl. The Coryton site has more than a half mile of river frontage with 40 ft. of water at low tide, enabling the world's largest tankers to berth at all tides and allowing quick turnaround. It also has facilities for loading barges and small tankers for up-river and coastal distribution. The Cory company also has an oil depot at Barry (Bristol Channel) with about 420,000 bbl. storage. In London, the Socony-Vacuum-Powell Duffryn announcement was called the first practical step towards solving Anglo-American difficulties over dollar and sterling oil. It was pointed out that Vacuum Oil, heretofore an entirely American company, will become an Anglo-American concern. The London reports said that essential approval of the project has been given by the British Government and that work will begin at soon as the necessary design work has been completed and final consent received from the various authorities concerned.

seeking additional guarantees for their operations over a long-term period.

"Profits" Squeeze

A small integrated oil operation in the trans-Andean region of eastern Peru has run into increasing difficulty as a result of government controls on foreign exchange and price regulation of its products.

The company is Ganzo Azul (Blue Goose) Petroleum Co. It has six producing wells on the Agua Caliente concession east of the Andes and 1,000-bbl. daily capacity refinery to meet petroleum needs through this isolated area.

In its recent report made public in Lima, the company said: "The present low selling prices of refined products as fixed by the Peruvian Government and the foreign-exchange controls of the dollar payments for export sales make it impossible for the company to operate at a profit."

The company pointed out that its equipment and property are deteriorating rapidly in the jungle country and said that unless it is permitted to increase its selling price and given relief from exchange controls, its facilities would reach the point where it would be unable to meet products needs and the entire economy of the section would be adversely affected.

It said the prices were completely out of line with other products and materials sold in Peru. It delivers products at prices of 6 to 7 cents per gallon (U.S.) for gasoline, 4 to 5 cents for diesel and kerosine, and 2 cents for fuel oil. It said $2,000,000 had been invested in the last 15 years and the stockholders have never received any return on their investment.

The company gave its 1949 production as 140,196 bbl. daily (about 400 bbl. daily), against 120,810 bbl. in 1948 and 118,000 in 1947. Its products were marketed in eastern Peru with only 3 per cent going to Brazil and Colombia. The statement said the marine department operates the longest river barge system in the world on the uncontrolled rivers of eastern Peru and western Brazil.

New Panamanian Fuel

"Alcoholina," a mixture of alcohol and gasoline, has been established as the national fuel of the Republic of Panama. A recent law authorizes the president to establish the formula for the mixture of alcohol and gasoline to be used in motor vehicles.

Of the alcohol used in the mixture, 70 per cent must be from fresh sugarcane juice and 30 per cent from molasses or other sources. The president is assisted by a technical committee in establishing the formula, and is also authorized to fix the selling price of the fuel and regulate the distillation of alcohol.

Mexican Field Extended

Petroleos Mexicanos has recently completed Moralillo 59 near Naranjos, Vera Cruz, in what was announced as an important extension of Moralillo field.

Initial production of the well was reported at 1,260 bbl. daily. Depth is 1,608 m. (about 5,270 ft.). Pemex officials said the well may extend the known limits of the field considerably.

Pemex also has announced location of several new structures which are to be tested soon. They are near Tuxtla Gutierrez in Chiapas, Cordoba in Vera Cruz, and Piedras Negras in Coahuila.

Reports continue in Mexico City of negotiations between Pemex and European companies for percentage-of-production drilling contracts of the type under which Mexican American Independent Oil Co. is now operating. Cie. Francaise des Petroles, partially owned by the French Government, is said to be discussing such an arrangement. Another company mentioned is Cie. Financiere Belge des Petroles, S.A. (Petrofina).

EUROPE

Sicilian Oil Law Approved

New Act is much more favorable to foreign oil interests than oil law in effect in Italy; oil companies interested

ACTING under its special regional autonomy from the Italian Republic, the Sicilian Government has aproved a new petroleum law designed to encourage oil exploration in the island.

In contrast to the situation in Italy, itself, where a state monopoly operates in the exploration and production field, terms of the Sicilian law appear sufficiently liberal for the participation of foreign capital. Some interest in Sicily's oil possibilities has been indicated by large companies.

Legal background.—The legal background of the new Sicilian oil law lies Italian constitutional provisions giving Sicily, Sardinia, and two other regions certain special autonomy in accordance with their constitutions. The Sicilian constitution was adopted May 15, 1947, and Sicily was granted exclusive competence regarding mineral laws.

In early 1948, the central government in Rome opposed this article of the Sicilian constitution and appealed its validity to the high court in Rome. The appeal was decided in favor of the region shortly thereafter.

In October 1949 Sicilian administrative officials decided to make necessary revisions in the old Italian mining law of 1927 and drafted a new law which was adopted by the regional assembly on February 17 of this year after discussion and debate. The representative of the central government at Palermo objected to the legislation as conflicting with the national interest, and an appeal was again taken to the court in Rome. The new Sicilian law became effective March 21 when the court held for the regional government.

What it provides.—Insofar as they are not in conflict, the Sicilian oil law leaves in effect provisions of the old Italian mining law and other legislative regulations. However, Sicily has provided a generally new legislative base for oil operations through the 9,927 sq. miles of the island.

Under the new Sicilian law, an exploration permit is granted by the regional minister for industry and commerce with a maximum of 10,000 hectares to any one entity. The area can be in several blocks. The initial exploratory period is 3 years, and if the obligatory work is performed, the operator can have two extensions of 3 years each. A commercial discovery is necessary to convert to an exploitation concession. The law provides that the original permit area is reduced automatically by 20 per cent at the end of the initial 3-year period, and by another 20 per cent at the end of the second period.

The operator can reliquish any or all of the area during the exploration phase. Conditions of the eventual exploitation concession may be stated in the exploration permit. Structure drilling within 2 years, and a deep test with a 5,000-ft. or heavier rig within 3 years is called for during the exploration phase. The operator must carry out any further work program included in the permit by negotiation, and pay a surface rental of 100 lire (625 to the dollar) per hectare per year during the exploration period on the area held at the beginning of the year. The permit cannot be transferred without government approval.

If a commercial discovery is made and provided the operator has negotiated terms of a concession which are stated in the permit, he has the automatic right to a concession on 40 per cent of the original permit area. Term of the concession is be-

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Above Right: Rig 17 shown here reached 10,624 feet after 152 days of continuous operations. J&L Drilling line on this rig has made more than 150 round trips and is still in good condition.

Above Left: Going back in after drill stem testing distillate on Arrow Drilling Co. Rig 17 in Lindsay Field, Garvin County, Oklahoma. In the foreground are Engineer S. E. Hudson, and Crewmen W. E. Hites and K. W. Keenan. Supervising are Tool Pusher L. E. "Mac" McConnell (left), and Driller W. W. "Woody" Moore. Derrickman (not shown) is Ray Satterwhite.

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tween 20 and 30 years with extensions possible.

The obligations of the concessionaire to the regional government include: to make a semiannual report to the Mining Bureau of progress of the operation and results; to pay the region in advance an annual rental of 500 lire per hectare on the area covered; and to pay royalty annually to the region, this royalty negotiated between the limits of 4 and 20 per cent.

The regional minister, with approval of the regional Mining Council, can forfeit a permit or concession with 60-day notice to the operator. Among grounds specified for this action are: nonpayment of rent or royalty; failure to carry out work obligations within the specified time; interruption of production for more than 6 months, and transfer to third parties without approval. In a permit or concession, the minister may establish an appropriate compromise clause by which forfeiture will be decided by a board of arbitration under the regular Italian Code of Civil Procedure.

Belgian Refinery Started

Construction work has been started on a new 30,000-bbl. daily refinery being built at Antwerp, Belgium, for Soc. Industrielle Belge des Petroles, jointly owned by Anglo-Iranian Oil Co., Ltd., and Financiere Belge des Petroles, S.A., (Petrofina).

The announcement regarding the plant was made last week in New York by M. W. Kellogg Co., which recently completed the process and design engineering for the project. The contract for the work is held jointly by M. W. Kellogg and its European subsidiary, Kellogg International Corp.

Kellogg International is directing the purchase of a major portion of all materials and equipment for this project from Belgium and other non-dollar manufacturing areas. The new plant will utilize normal refining processes and will have facilities for operation as a completely integrated refinery.

The site is adjacent to the Scheldt River, and extensive development work has been undertaken by the Port of Antwerp Authority to improve tanker facilities. The refinery has been planned to allow sufficient space for future additional process units, such as for lubricating oil and high-octane gasoline. Completion of the project is scheduled for mid-1951.

Oil Tops British Expansion

Expansion of the petroleum industry in the United Kingdom is far greater than that of any other British industry.

Investment in petroleum projects, mainly refinery expansion, is estimated during the current year at £32,000,000 ($90,000,000) as compared to £16,000,000 in 1949 and £9,000,000 in 1948. This growth exceeds all other industries, though the absolute outlay is smaller than that, for example, in electric power.

These figures were given in the recently published British Government white paper, Economic Survey for 1950. It commented on the petroleum program as follows:

"Work continued during 1949 on the expansion of four refineries in the United Kingdom, Shell Haven, Stanlow, Llandarcy, and Grangemouth, and a fifth refinery was started in July at Fawley. All these projects, and a sixth one on which it is expected work will start during 1950, will be in complete or partial operation by the end of 1952, when the total refinery capacity in the United Kingdom will be about 12,000,000 tons per annum (about 360,000 bbl. daily)."

As regards the international operations of British oil companies, the report said that a big increase in net earnings from oil can be expected as production and refinery capacity expand. This is provided there is not serious reduction in oil prices.

Of all United Kingdom imports in 1949, more than 13 per cent were financed by Marshall plan aid. Included was 25 per cent of the total petroleum imports. British dollar expenditure in chartering tankers in 1949 dropped to $9,000,000 from $27,500,000 in 1948.

CANADA

1950 Oil Outlay

SARNIA, Ont.—The petroleum industry in Canada will spend $300,000,000 this year in expanding all divisions of its operations, G. L. Stewart, president of Imperial Oil, Ltd., told stockholders of the company at its annual meeting here April 28.

Stewart, who is a former superintendent of Imperial's large refinery here, said that these projected outlays represent about 10 per cent of all the proposed industrial expenditures in Canada this year.

The Imperial president was optimistic regarding present and future trends in Canada's petroleum consumption but was disappointed at the profit margin last year.

In pointing out that Canada's per capita consumption of petroleum was increasing much more rapidly than in the United States, he said present requirements are 8½ bbl. per year in Canada and 14½ bbl. in the United States. He said, however, that since 1945, Canada's per capita use had increased 53 per cent while that of the United States was 8½ per cent.

Stewart explained that Imperial officials were concerned with the fact that unit profit for manufacturing and marketing operations was only ¾ cent per gallon last year. This was a little more than half the company's tax bill, not including the provincial gasoline taxes, which were 12 to 19 times as much as the per-gallon profit.

In summarizing current operations, Stewart said that the company has completed 72 development wells in Alberta this year and the company's potential production at this time is about 60,000 bbl. daily with an actual output of 26,000 bbl. daily. This will be increased as the Interprovincial Pipe Line Co. line is completed later this year extending from Edmonton to Superior, Wis.

Big Exploration Spread

Imperial Oil, Ltd., has secured approximately 600,000 acres of crown exploration permits in southwestern Manitoba, Canada. They are the first taken by Imperial in this central Canadian province.

Imperial has been active in Alberta in recent years, where it accounts for about one-half of the oil production, with a major program conducted on millions of acres of crown and freehold lands. In Saskatchewan the firm also has a few million acres of freehold lands under exploration commitment, but no crown lands under permit.

The newly acquired permits extend from the Riding Mountain area westward to the Saskatchewan border and the south end is 96 miles north of the United States border. The southeast corner is about 39 miles north of the city of Brandon and 115 miles west-northwest of Winnipeg.

Crown Reserve Leasing

CALGARY.—"Cash bonus" bidding on 4,494 acres of government crown reserve leases in Alberta, Canada, will be held May 11.

Under Canadian regulations, 50 per cent of the crown lands leased in any township become crown reserve. For any lease granted to an individual or oil company down to the quarter section, automatically means creation of a crown reserve of equal area. In addition, crown reserves comprise more than a dozen multitownship areas, totaling several million acres, set aside as provincial petroleum reserves a decade ago.

Periodically the government offers for lease on receipt of requests from the industry, various crown reserves. These are usually on a cash bonus basis, though on some parcels a fixed or competitive royalty bonus has been added. In the May 11 sale, seven Redwater quarter sections, of which several adjoin richly productive lands; two quarters adjoining production in the Excelsior field; and assorted unproven lands will be offered to the bidders.

PERSONALS

Steps Up

Haider named Imperial Oil vice president

M. L. HAIDER, Toronto, general manager of Imperial Oil, Ltd.'s, producing department, has been appointed a vice president of the company. He has been a director of the firm since 1948.

A graduate of Stanford University, Haider holds a B.S. degree in chemistry. After working as an analytical chemist, he began his career in the petroleum industry as a natural-gas engineer.

Haider joined Carter Oil Co. in 1929 and in 1934 was transferred to Tulsa as chemical engineer. He was named chief engineer of the company in 1937 and held that position when he joined the production-research and engineering department of Standard Oil Development Co. in 1938. In this latter position he was in charge of a group responsible for research into all aspects of oil exploration and development.

Remaining in this position until 1945, Haider joined the producing department of Standard Oil Co. (N. J.). He went with Imperial the following year as head of its producing department.

R. C. Alden has been named chairman of a newly formed research planning board of Phillips Petroleum Co., Bartlesville, Okla. Other members of the board, which will facilitate long-term planning of the firm's research and development program, include: **T. B. Hudson, W. A. Schulze,** and **K. H. Hachmuth. R. W. Thomas** is manager of the department, and **G. G. Oberfell** is research vice president. Other changes in the research division include: **W. B. Reynolds,** appointed assistant director of chemicals and rubber branch; **F. W. Crawford,** named assistant director of production and physics branch; and **D. E. Carr,** appointed assistant director of combustion and lubrication branch. **J. A. Young,** patent division, replaces Hudson as manager, with **J. P. Jones** as assistant manager. **L. C. Morris** has been placed in charge of a newly formed administration and personnel branch, with **R. R. Couch** assistant office manager.

R. L. Fillner, formerly district production manager at Grand Rapids, Mich., for Ohio Oil Co., has been named division landman at Casper, Wyo., succeeding the late D. W. Sellery. Fillner joined Billings Gas Co., subsidiary of Ohio, in 1922.

H. L. Shatto, mechanical engineer for Shell Oil Co., has been transferred from New Orleans to Houston in the same capacity.

C. C. Alexander, operating superintendent, Harvey district, the California Co., has been named assistant division superintendent, Gulf Coast division, Harvey, La.; **D. D. Jackson,** offshore operating superintendent, has been named assistant division superintendent, Gulf Coast division, Harvey; **H. E. Denzler, Jr.,** Gulf Coast division field engineer, has been named transportation superintendent, Harvey, and **G. W. Osborne,** production department, New Orleans, will replace Denzler at Harvey.

Arnold Hofland, formerly managing director of Deutsche Shell, A. G., has taken over the management of the European interests of the Shell Group in London. **A. de Graan,** formerly managing director of the Italian Shell company, has succeeded Hofland.

Grayson L. Kirk, vice president of Colombia University, has been elected to the board of directors of Socony-Vacuum Oil Co., Inc., marking the first time in the company's history that a director has been chosen from outside company personnel.

John W. House, Midland, Tex., has been reelected president of the Lea County, Texas, Oil and Gas Operators Association.

T. L. Regan, division superintendent at Oklahoma City for Stanolind Oil & Gas Co., has been transferred to Houston in the same capacity, and has been succeeded in Oklahoma City by **K. W. Bolt,** Casper, Wyo., division superintendent.

Marshall Johnson, formerly division geologist for Shell Oil Co., Odessa, Tex., has joined Trebol Oil Co., Odessa, as geologist. **S. W. Holmes,** Hobbs, N. M., replaces Johnson at Shell's Odessa office.

Trevor Moore, Toronto, has been elected a director of Imperial Oil, Ltd. He formerly was vice president and director of the firm of McLeod, Young, Weir & Co., Ltd. **D. W. McGibbon** has been appointed treasurer of Imperial, and **John W. Hamilton** has been named general counsel.

Dr. Wayne E. Kuhn, manager of the technical and research division, The Texas Co., has been awarded the second Honor Scroll of the New York Chapter, American Institute of Chemists, in recognition of his efforts in advancing the chemical profession. Dr. Kuhn joined Texaco in 1929 as a chemist, and in 1938 became manager, technical and research division, in charge of all technical and research work for the firm's refining division. He was named chairman of the petroleum division, American Chemical Society, in 1949.

C. O. Tongberg has been named associate director, and **J. G. McNab** and **C. L. Fleming** have been named assistant directors of the research division of Standard Oil Development

TONGBERG *FLEMING* *McNAB*

Co. Tongberg succeeds **S. C. Fulton,** who becomes associate director of the chemical division. Other changes include: **Charles E. Morrell,** named staff chemist; **Stewart H. Hulse,** senior research associate in the process division, transferred to the research division; **Albert J. Blackwood,** assistant director, assuming responsibility for the principal staff functions of the division; **Byron M. Vanderbilt,** assistant director of the chemical division, named responsible for new process-development work in the petroleum field; **Miller W. Swaney,** assistant director, chemical division, named supervisor of mechanical and clerical

staffs; and **Philetus J. Holt, II,** assistant director, research division, assuming business managership of the division, assisted by **Oliver J. Kangas.**

William F. Brown, general foreman in the lubricating-oil division of Continental Oil Co.'s Ponca City, Okla., refinery, has been selected as one of 14 men from American industry to be awarded a 1950-51 Sloan Fellowship at Massachusetts Institute of Technology, Cambridge. Brown has been granted a leave of absence from Continental while studying business administration and economics at Cambridge. He joined Continental in 1943, and became general foreman in the lubricating-oil division in June 1948.

D. E. Pyburn, Shreveport, and **J. W. Newman,** Kilgore, Tex., both formerly with Retsal Drilling Co., have formed the P & N Drilling Co., with headquarters in Shreveport.

James H. Curtis has been appointed manager of manufacturing for General Petroleum Corp. This is the second major advancement for Curtis in the past 14 months. In February 1949 he was named manager of refineries, and prior to that had been in charge of the firm's Torrance, Calif., refinery. Joining General in 1942, Curtis formerly was with the Lummus Co., as process engineer in charge of setting up initial operations of newly constructed refineries. He was named assistant manager at Torrance in 1944 and manager in 1945. He is a graduate of the University of Michigan.

Chester M. Crebbs, who retired last year as president of Mene Grande Oil Co., C.A., was presented the Venezuelan Order Francisco de Miranda, second class, in Washington recently. The decoration was conferred by Jose Rafael Pocaterra, Venezuelan ambassador, in a ceremony at the Venezuelan Embassy. Crebbs, who was associated with Gulf for 31 years, 26 of which were in Venezuela, was cited for his services to science, the progress of the country, and for outstanding merit.

C. W. Evelyn, Jr., has been appointed district superintendent at Casper, Wyo., for British-American Oil Producing Co. He will have supervision of all production and exploration operations in Montana, Colorado, Nebraska, and Wyoming. Other assignments to the newly established Casper office include: **H. C. Gleason,** district engineer; and **Jay Sanderson,** district clerk. **M. T. Johnston,** Riverton, Wyo., superintendent of Steamboat and Pilot Butte fields, and **W. A. Day,** Cut Bank, Mont., foreman of the Cut Bank field, will report to the new office. **W. W Moore,** Tulsa, is general production and engineering division superintendent. Evelyn has been with British-American since 1948. Prior to that he was with Frontier Drilling Co., Denver.

C. W. EVELYN, JR.

C. W. Frank, petroleum engineer for Phillips Petroleum Co. at Alvin, Tex., has joined Progress Petroleum Co., Houston, as assistant general superintendent of production and engineering.

William F. Latting, for the past 4 years director of personnel and employe relations for Barnsdall Oil Co., Tulsa, has been named secretary of Lucey Products. Latting joined Barnsdall as a tax attorney in 1938, and from 1938-1942 he was given leave of absence to serve as a member of the Oklahoma House of Representatives.

E. Dunlap, Jr., E. V. Dunlap, and **E. Dunlap,** all of Ardmore, Okla., have formed the Triplee Oil Co. and the Tripledee Oil Co.

H. H. Hewetson has been designated as a nominee for election as a director of Standard Oil Co. (N. J.), replacing **R. T. Haslam,** vice president and director who plans to retire this fall. He asked that his name not be presented for reelection. The annual meeting of shareholders at which directors will be chosen will be held June 7 in Linden, N. J. Hewetson, chairman of the board of directors of Imperial Oil, Ltd., a Jersey Standard affiliate, formerly served as Imperial's president. At one time he served as vice president and general manager of the Esso refinery at Baton Rouge, La.

H. H. HEWETSON

Harry H. Moore has been appointed division sales manager of the White Eagle Division, Socony-Vacuum Oil Co., Inc., with headquarters in Kan-

A.A.P.G. OFFICERS.—Some of the past and present officers of the American Association of Petroleum Geologists are shown at the Chicago convention last week. Front row, left to right: John Emery Adams, Standard Oil Co. of Texas, Midland, vice president; Clarence L. Moody, Ohio Oil Co., Shreveport, president; and C. W. Tomlinson, independent operator, Ardmore, Okla., past president. Back row, left to right: Paul Weaver, Gulf Oil Corp., Houston, past president; Henry N. Toler, Southern Natural Gas Co., Jackson, Miss., secretary-treasurer; A. H. Bell, Illinois Geological Survey, Urbana, editor; and Theodore A. Link, consultant, Toronto, Ont., Canada, past vice president.

PERSONALS

sas City, Mo.; and **Earl B. Kendrick** has been appointed assistant manager.

George A. Butler, Houston, has been named a director of Texas Eastern Transmission Corp.

© Bachrach

James Tanham, vice president of The Texas Co. in New York, recently received the annual award of merit from the New York Personnel Management Association for "outstanding achievement in the field of personnel relations." Tanham has been with The Texas Co. since 1941 and has served as executive assistant, assistant to the vice president, and assistant to the president. He was named vice president in 1941.

Wesley G. Gish, Tulsa, vice president of land and exploration for Deep Rock Oil Corp., has left the company and will enter the private practice of petroleum geology. A graduate of the University of Nebraska, Gish has been active in the Mid-Continent and Gulf Coast areas since 1921.

R. E. Kreider, Jr., formerly technical assistant in the thermal cracking section at Esso Standard Oil Co.'s Bayway, N. J., refinery, has been named head of a new section in the operations-analysis department responsible for process design, conservation, economics, standards, and utilities. He is succeeded by **W. N. Thompson,** who headed the chemical-operations section of the same department. **R. J. Anderson** now heads the chemical-operations section and was succeeded as head of the extraction and polymerization group by **J. J. Fennell.**

J. E. Spaulding, formerly with the California Co., has been elected president and director of the recently organized Tri-State Oil & Refining Co., Denver.

Edwin B. Cox and **Jake L. Hamon,** Dallas oil operators, have dissolved their partnership.

William H. Curry, head of Far West Oil Co., has opened offices in Casper, Wyo.

E. O. Mattocks, technical representative of Phillips Petroleum Co., Bartlesville, Okla., has joined the American Petroleum Institute as staff engineer in the newly created technical-service department. He is a graduate of Cornell University and has been with Phillips since 1937.

Wallace E. Pratt, geologist, was honored recently at a dinner in New York City, where he was given the Kemp Medal for distinguished service in geology by **Dwight D. Eisenhower,** president of Columbia University.

FRANK CHILSON

Frank Chilson, chief engineer for Fish Constructors, Inc., Houston, has been named assistant manager of the company. Other changes include: **J. W. Hall,** assistant pipe-line superintendent, named general pipe-line construction superintendent succeeding **Walter H. Davidson,** who has joined Transcontinental Gas Pipeline Co. as construction superintendent; and **E. M. Lemcke,** named chief engineer replacing Chilson.

Harry T. Rice, a staff member of the chemical-products laboratory at Esso Standard Oil Co.'s Bayway refinery, has been elected president of the Esso Research Club, succeeding **Howard L. Yowell.**

DEATHS

Howard Ellsworth Cole, 73, former vice president and a director of Standard Oil Co. (N. Y.), died April 27 in New York City. He became associated with Standard Oil Co. of Cleveland as a young man, and later became assistant to the vice president and general manager of Watters-Pierce Oil Co. in Mexico. He served in Japan and Korea and in 1924 was named director and vice president of Standard of New York. He retired in 1930.

John F. Maloney, 81, Allegany, N. Y., former president of Erie Oil Co., died in Austin, Tex., April 22.

Charles A. Lewers, 61, sales manager for the White Eagle Division of Socony-Vacuum Oil Co., Inc., died in Kansas City, Mo., April 20.

David Stewart Roberts, 55, manager of the real estate department of Esso Standard Oil Co., died in Westfield, N. J., April 28.

Robert B. Dickson, president of Kewanee Boiler Corp., died in Kewanee, Ill., April 9.

Frank N. Sheehan, 61, Tulsa, associated with Sheehan Pipe Line Construction Co. since 1930, died in Vincennes, Ind., April 29 following an automobile accident near Vincennes.

A. H. Kasishke, 57, Tulsa, president of Alkay Oil Co., died April 28. The Corelena Oil Co., which he built into a $5,000,000 firm, was sold to Co-Operative Refining Co., Kansas City, Mo., 3 years ago, and Kasishke consolidated his holdings under the Alkay name.

James Earl Thompson, 67, farm boss for Amerada Petroleum Corp. at Forsan, Tex., died April 18. He had been with the company 22 years.

Thomas S. Beason, 78, retired Pleasantville, Pa., oil producer, was killed in an automobile accident in Pleasantville April 25.

Hobert E. Fugate, 53, district production foreman for Tide Water Associated Oil Co., with which he had been associated for more than 23 years, died in Kilgore, Tex., April 12.

James Edmund Pennybacker, 50, executive in the Japan-Korea division of the marketing organization of Standard-Vacuum Oil Co., died April 21 in Tokyo. Pennybacker, who joined Standard-Vacuum in 1923 and who during the war assisted in the movement of military petroleum supplies from Burma to China, had been on loan to the occupation forces in Japan serving as chairman of the Petroleum Advisory Group. He recently was on furlough in the United States and had only returned to Tokyo last month.

Carl August Halgren, 62, foreman of the machine shop at the Bayonne, N. J., refinery of Tide Water Associated Oil Co., who had been with the company for 43 years, died April 21 at Bayonne.

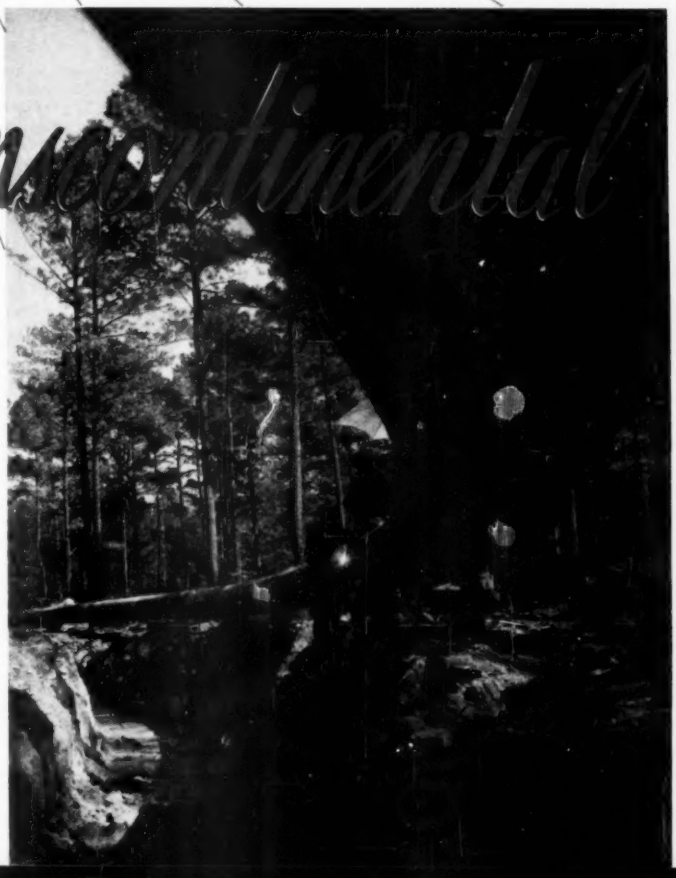
R. C. Hohl, Sr., 57, commission agent, Magnolia Petroleum Co., Houston, died April 23.

Harry T. Maul, 74, formerly with Oil Well Supply Co., died in Oil City, Pa., April 25.

BY CLAUDE A. WILLIAMS
President, Transcontinental Gas Pipe Line Corp.

This special editorial section presents one of the marvels of the twentieth century . . . TRANSCO, the longest pipe line in the world . . . and the longest single-project construction venture ever to be built . . . In terms of natural gas . . . it well depicts a new era in pipe lining.

The Story of Transcontinental



TRANSCONTINENTAL GAS PIPE LINE CORP. is proud to be a part of the vigorous gas industry. We are pleased with our role of bringing natural gas from the Southwest to the Mid-Atlantic seaboard.

By December 1 we expect to be making our first deliveries of gas.

This 30-in. line, running 1,832 miles from the Rio Grande Valley to 134th Street, New York City, was planned in the difficult postwar period.

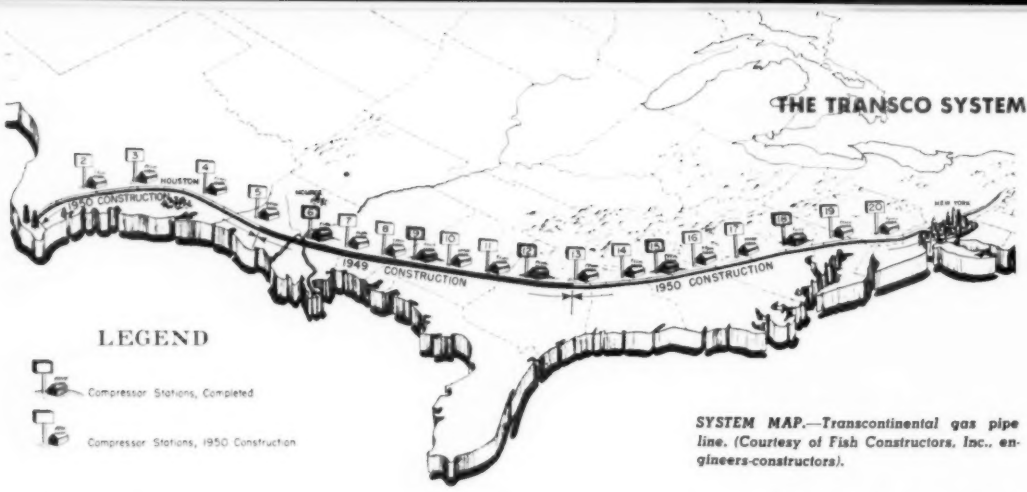
Owners of gas were slow to commit reserves to a new company. Distributors of gas wondered about signing up with a company whose line was still on paper. Investors had to be persuaded that the whole gas industry was as good as it looked and that this particular project would pay out. Large-diameter steel pipe and plate from which to make it were really scarce.

The Federal Power Commission had to be satisfied on important points: need, economic feasibility, sufficient gas reserves, assured markets, and commitments for the money to build the project. Inherent in our application was the larger question of how far the natural-gas industry should be expanded.

Difficulties were overcome. The original FPC certificate was granted May 29, 1948. Transcontinental exists by virtue of the cordial cooperation of many well wishers in private business and public agency. Its construction goes ahead on schedule because of the enthusiastic effort of many skilled fellow workers.

Total financing, which will exceed $200,000,000, has been accomplished entirely with private funds.

Initiated and planned by Texas and Louisiana people, Transcontinental is



SYSTEM MAP.—Transcontinental gas pipe line. (Courtesy of Fish Constructors, Inc., engineers-constructors).

still controlled by Texas and Louisiana stockholders.

Originally Transcontinental's authorized capacity was 340,000,000 cu. ft. daily. Need for greater capacity by the time our line could be completed was indicated. Consequently, FPC was asked to increase our capacity to 505,000,000 cu. ft. daily.

To accomplish this, 362 miles of planned 26-in. line would have to be built with 30-in. pipe. Twelve additional compressor stations would have to be installed. Authority for the substitution of pipe was granted. Authority for the additional compressor capacity is expected soon.

As of April 1 approximately 650 miles of main-line pipe had been placed in the ground.

This summer we shall have 14 main-line construction spreads running simultaneously—perhaps a record for one line.

If FPC authority for the additional horsepower comes through we shall have also 14 compressor stations building this year.

About 400 miles of gathering and sales lateral go into this year's construction.

Fourteen major river crossings, not included in regular main-line construction contracts, complete the year's construction for Transcontinental. These include aerial crossings on the Atchafalaya, Brazos, and Colorado rivers. Among the underwater crossings are those on the Hudson, Delaware, Potomac, James, and Mississippi rivers.

A pipe line takes pipe. Transcontinental got Kaiser Steel Co. to supply its major plate requirements at the Fontana plant. Consolidated Western Steel Corp. at a nearby plant fabricates the plate into pipe.

Total steel-plate requirements of approximately 540,000 tons have been coming along on schedule. Pipe fabrication is on schedule. No work stoppage is indicated in steel or coal for the remainder of the year. We believe our needs for pipe will be met on time.

The country is not running out of gas.

In the case of Transcontinental, reserves are adequate for 20 years at the requested daily capacity of 505,000,000 cu. ft. The professional staff of FPC has so testified.

Total natural-gas reserves in the United States as of January 1, 1950, were 180.4 trillion cubic feet, according to the accepted reliable estimate of the American Gas Association.

These reserves were 173.9 trillion cubic feet as of January 1, 1949. Thus, the United States had a net gain in reserves of approximately 6.5 trillion cubic feet during 1949. This net gain is marked up after a record-breaking net production of 6.2 trillion cubic feet of natural gas in 1949 as reported by the American Gas Association.

Transcontinental takes its gas from 34 different fields extending along 600 miles of the Texas-Louisiana Gulf Coast. There are more than 50 trillion cubic feet of discovered recoverable natural-gas reserves in our supply area.

Modern, long-distance gas-transmission lines today render distinguished service to the American people and the American economy. They provide a market and a reasonable return to gas producers and royalty owners.

There are still shut-in gas wells in Texas and Louisiana. Not all the waste of natural gas has been eliminated. In Texas the average price of natural gas at the well has advanced to the

UPHILL AND DOWN . . .

. . . AND ACROSS RIVERS

. . . AND ITS SUPERVISORY PERSONNEL

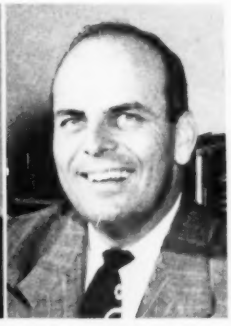
CURTIS MORRIS
Vice president

JOHN F. BURTON
Vice president and treasurer

DR. I. I. GARDESCU
Vice president, reserves

JAMES B. HENDERSON
Vice president, general counsel

LUKE V. PATRICK
Comptroller



TOM WHEAT
Secretary

point where it has become worth while to save flare gas. Of all gas produced in Texas about 22 per cent is in conjunction with oil. This is referred to as flare gas because of the former practice of burning it in flares to get rid of it.

Transmission lines carry this premium fuel to marketing companies throughout the nation. Natural gas can be sold today in the Northeast on a B.t.u. basis cheaper than any other fuel.

Transcontinental sells its gas to distributors already established in its market area. Among these distributors are some of the most honored names in American public utilities. The company's present list of gas distributors include Philadelphia Electric Co., Philadelphia Gas Works Co., Elizabethtown Consolidated Gas Co., South Jersey Gas Co., Public Service Electric & Gas Co., Consolidated Edison Co. of New York, Brooklyn Union Gas Co., Brooklyn Borough Gas Co., Long Island Lighting System, and Kings County Lighting Co.

Pending before FPC is the application of Northeastern Gas Transmission Co. to supply natural gas to New England. Transcontinental has a contract with Northeastern to furnish it initially with 100,000,000 cu. ft. of gas a day.

CLYDE McGRAW
Independent engineer

Some weeks ago there was a public statement to the effect that our company was contemplating looping its line with 36-in. pipe. Studies indicate that in our presently authorized market area there will be a need for 2 billion cubic feet of gas a day within 10 years.

. . . AND ITS HISTORY

February 1946.—Claude A. Williams organized Trans-Continental Gas Pipe Line Co. with all stock owned by him and Rogers Lacy.

While negotiations were pending for buying War Emergency Pipelines, application was made to Federal Power Commission for permission to acquire W.E.P. or to build Texas-Eastern Seaboard line if W.E.P. could not be bought.

Subsequently Ray C. Fish, Clyde H. Alexander, and others became stockholders in Transcontinental.

Just prior to Transco financing, it was decided that assets of Trans-Continental Gas Pipe Line Co. (a Texas corporation) be acquired by its successor Transcontinental Gas Pipe Line Corp. (a Delaware corporation).

At first bidding for W.E.P. (Big Inch and Little Big Inch), Transco was highest bidder. At second bidding in 1947, W.E.P. was bought by Texas-Eastern Transmission Corp.

May 1946.—Original application submitted to FPC.

Natural-gas reserves for the system were substantially negotiated and finalized; negotiations for sale of gas were advanced. Transactions were not altogether with the same companies and for the same locations as in final arrangements.

October 17, 1947.—Hearing began before FPC.

In preparation for the hearing, extensions from March 1 to June 1, 1948, were negotiated for revision of contracts at both ends of the line.

May 1948.—FPC issued conditional certificate subject to procurement of pipe and financing.

September 28, 1948. — Steel contract with Kaiser Co., Inc., was signed.

December 3, 1948 — Completion of financing was followed by letting contracts for 605 miles, 30-in., Eunice, La.-Danielsville, Ga.

May 23, 1949.—Ground-breaking ceremonies at Laurel, Miss.

March 1, 1950.—First 605-mile section and five compressor stations substantially completed.

Plan 1 originally financed for $191,500,000 for transmitting 346,000,000 cu. ft. daily will be increased by Plan 2 to be financed for $240,000,000 to furnish 505,000,000 cu. ft. capacity. The latter is planned for completion April 1951 with construction of 2,400 miles of line including 1,800 miles of main and 600 miles of gathering lines.

. . . and the story of the

Builders

One of the planes in Fish fleet.

by Ray C. Fish

FISH ENGINEERING CORP., engineers and constructors to the oil and gas industry, whose affiliate, Fish Constructors, Inc., is engaged in the design, engineering, and construction of the Transcontinental Gas Pipe Line system, was organized in Houston in April 1946, by Ray C. Fish, R. D. Ricketts, C. B. Ames, O. L. Mullen, and A. J. L. Hutchinson.

Prior to the organization of Fish Engineering Corp., each of the founders had been engaged in design, engineering, and construction of processing plants for the oil and gas industry, and the combined experience of these men covered the completion of oil refineries, distillate - recovery plants, pressure-maintenance plants, dehydration plants, chemical plants, compressor stations, and gas-transmission systems. During the war, President Ray Fish had complete charge of design, engineering, and construction of the Tennessee Gas Transmission System, the first complete major gas-transmission system constructed since the early thirties, so it is only natural that the endeavors of this corporation should be directed toward the gas-transmission industry.

One of the first contracts undertaken by Fish Engineering Corp. was to serve as consulting engineers to the newly formed Transcontinental Gas Pipe Line Corp. which was organized in 1946 for the purpose of either purchasing from the United States Government and converting the Big Inch oil lines to a natural-gas-transmission system or to construct a new gas-transmission system from the Gulf Coast area of Texas to the eastern seaboard. It was decided finally that a new system would be designed, and work along this line continued through 1948 during which time surveys, estimates, and economic studies were made, and an application was submitted to Federal Power Commission. In May 1948 FPC granted a certificate of convenience and necessity to Transcontinental whereupon Fish Engineering Corp. assisted Transcontinental in obtaining the necessary steel supply for the main-line pipe and in the financing of the over-all project.

On September 28, 1948, Transcontinental authorized Fish Engineering Corp. to handle the complete design, engineering, and construction of its gas-transmission system. The scope of this work includes the over-all planning and design of the complete system; the selection of the route; the design and location of compressor stations, dehydration plants, meter stations, gathering and sales laterals, and all other facilities; the aerial and ground surveying of the right-of-way; the preparation of all route, ownership, and property maps; the acquisition of all land and rights-of-way including permits for the crossings of highways, rivers, and railroads; the preparation of all designs and specifications; the purchasing of all materials and equipment; the securing of bids for and the awarding of all subcontracts; the supervision and inspection of all construction work; the establishment of a uniform accounting system; the complete testing and placing in operation of the system, and the selection and training of personnel for operation.

On account of the considerable volume of engineering and construction work being prosecuted by the corporation at the time of the commencement of the Transcontinental project, and by reason of the necessity of establishing complete and separate records of all phases of the Transcontinental project which records will become the property of Transcontinental upon the completion of the work, it was decided to handle this project in a separate corporation, and, for this purpose, Fish Constructors, Inc., was organized.

Upon the formation of Fish Constructors, Inc., R. D. Ricketts, vice president of Fish Engineering Corp., assumed complete charge of the project as its general manager and immediately commenced expansion of the organization.

Frank Chilson, an engineer of wide and varied experience who was well known to the management of Fish Engineering Corp. through his close identity with the oil and gas industry, joined the Fish Engineering organization and was assigned to the Transcontinental project as chief engineer. He immediately commenced the expansion of the engineering department to meet progress require-

RAY C. FISH
President

O. L. MULLEN
Construction superintendent

W. R. GIGNILLIAT
Manager, land department

J. R. IMBER
Secretary-treasurer

FRANK ISENHART
Purchasing agent

E. CAREY LINK, JR.
Traffic manager

C. L. GRIFFIN
Personnel manager

E. M. LEMCKE
Chief engineer

ments of the project, and in addition to handling the engineering of the entire project has served as a direct assistant to the general manager on other matters pertaining to the project. The assistant chief engineer is Ewald M. Lemcke, a civil engineer with considerable experience in heavy construction and project planning.

In January 1949, Walter Davidson, formerly with Natural Gas Pipe Line Co. of America, joined the organization as construction superintendent. J. W. (Bill) Hall is general pipe-line construction superintendent.

William Gignilliat joined the organization in the latter part of 1948 and, as manager of the land department, immediately commenced the organization of a department which was to be required to obtain some 2,000 miles of right-of-way in the ensuing 18-month period.

Other key personnel who joined the Fish organization to take part in the Transcontinental project included Claude C. Harris, comptroller; E. Carey Link, Jr., who is in charge of the traffic and material-control department; Frank Isenhart, purchasing agent; D. R. Croft, compressor-station superintendent; E. N. Armstrong, measurement superintendent; H. A. Rhodes, communications superintendent; and C. L. Griffin, personnel manager.

Survey crews in January 1949 were placed in the field to locate the route of the main line, and the acquisition of right-of-way was commenced. After careful consideration and study, it was decided that the work should be divided into two construction periods which would be coordinated with the delivery of main-line pipe and weather conditions along the right-of-way.

The 1949 construction period included the installation of the main line from proposed compressor station No. 5, located near Eunice, La., to a point near Athens, Ga., a distance of approximately 605 miles, and the commencement of work on the portion of the main line located in New Jersey commencing at the west bank of the Hudson River and proceeding in a southerly direction.

During 1949, compressor stations Nos. 6, 9, 12, 15, and 18 were constructed. The commencement point near Eunice was selected by reason of that being the point of intersection with the Louisiana Gas Gathering Lateral System, the most easterly point where gas is fed into the pipe line. It was planned to concentrate the work of constructing the system from that point on to the eastern market in order that gas deliveries can be commenced at the earliest possible time even though the remainder of the main-line system south of Eunice is not completed.

The five compressor stations constructed in 1949 are in the eastern section of the main line which will afford a means of compressing the gas for testing and commencement of operation of the partially completed system.

The 1950 construction period includes the installation of the balance of the main line, the sales and gathering laterals, compressor stations, dehydration plants and metering stations.

Work of constructing the pipe-line system generally is being handled through the use of subcontractors. The construction of the compressor stations and dehydration plants is being performed by Fish Engineering Corp., the amount of which work is estimated to be $50,000,000.

It is interesting to note that since its original organization by five founder members, the Fish Engineering Corp. organization has expanded to the point where presently there are approximately 1,250 employes engaged in work on Transcontinental and other projects.

In the past 4 years, Fish Engineering Corp. has performed the design, engineering, and construction of numerous other projects in addition to the Transcontinental System. Included in the various projects so handled are a distillate-recovery plant for Southwest Gas Producing Co. at Dubach, La., at a cost of approximately $4,000,000; the complete revamping and enlargement of the Carthage plant of the Chicago Corp. at a cost in excess of $2,000,000; natural-gasoline plant for Barnhart Hydro Carbon Corp.; natural-gasoline plant for Cisco-Hydro Carbon Corp.; the complete expanding of three gasoline plants and construction of a loading and storage installation for Humble Oil & Refining Co. in East Texas; compressor-station additions for the Panhandle Eastern Pipe Line System in Kansas, Missouri, and Illinois; compressor-station additions for the Northern Natural Pipe Line System in Kansas and Nebraska; three complete compressor stations for Peoples Natural Gas Co. in Pennsylvania; a Cycloversion reforming unit for McCarthy Oil & Gas Co., and numerous other installations for oil and gas companies the total of which work exceeded $50,000,000.

In addition to the work on the Transcontinental System, Fish Engineering Corp. at the present time has in progress the design and construction of numerous gasoline-plant additions and a complete oil refinery to be constructed in Honolulu, T. H.

Recently, Fish Engineering Corp. has entered into another major contract for the complete engineering and construction of a natural-gas pipe-line system. It is presently planned that work will commence in the next few months on the Texas-Illinois Pipe Line project which will consist of a gas-transmission system from La Gloria field in Jim Wells County, Texas, to Chicago. This project is estimated to cost approximately $120,000,000.

Currently Fish Engineering Corp. has under contract, and in various stages of engineering and construction, work totaling in excess of $380,000,000. The present organization is being expanded as the progress of the work demands, and it is expected that the organization this year will total several thousand employes.

DESIGN OF

GAS-COMPRESSOR STATIONS AND DEHYDRATION PLANTS

by C. B. Ames

C. B. AMES
Vice president, Fish Constructors, Inc.

AS a part of the Transcontinental Pipe Line System, transporting natural gas from Texas to the eastern seaboard, there will be 19 compressor stations spaced approximately 80 miles apart.

The initial gas capacity of the system, as provided for in the certificate issued by Federal Power Commission, required seven stations. The location of the stations were determined by the ultimate line capacity.

Design and engineering on five of the stations was started early in 1949. The basic design follows conventional methods employed by other gas-transmission systems with careful engineering studies being made to take advantage of the latest developments. It was realized at the beginning of the project that in order to construct the stations within a predetermined cost, all parts that are sometimes referred to as luxury items and not absolutely essential to the operation of the station would have to be eliminated.

Selection of Station Sites

While it is of considerable importance to locate a compressor station site near the theoretical point, there were other factors to be considered which overshadowed theory and made it practical to locate it several miles away. The average Transco station site requires a plot of ground 1,000 lineal feet square to accommodate up to 12,000 hp. This space permits the main line to pass through the site with ample distance maintained from the main compressor building and other equipment. Insurance companies recommend a minimum distance of 250 ft. to the closest building in case of line failure. The plot is also of sufficient size to accommodate pipe line maintenance facilities and personnel camp consisting of four to six cottages.

Other important factors considered in selecting the compressor station sites were soil bearing; topography; natural drainage, and the availability of water from underground sources or nearby streams.

The present trend to larger compressor units made it imperative to select a site near a rail siding with a suitable road to the station. The word, "suitable road," does not necessarily mean paved highway but, rather, that bridges were limited to the culvert type that could be readily cribbed or planked and that roadbed support the heavy load of the large compressing equipment. In some cases it was found to be more economical to pay a premium for a clear and level site incorporating the above features.

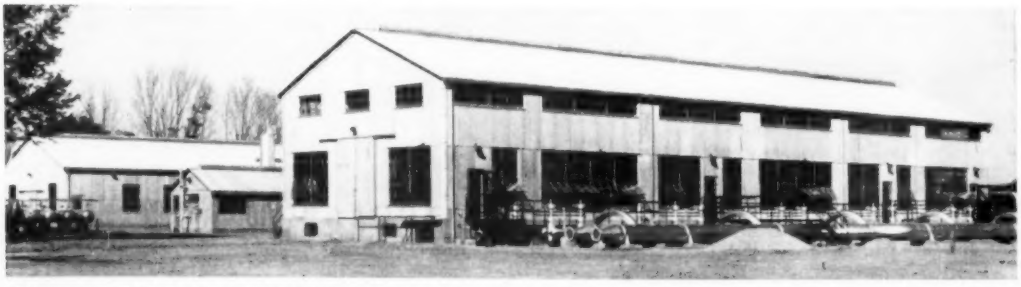
Compressors

Selection of the compressor units for Plan I was based on a study comparing the economics of installing engines of various horsepower. The study included both installation and operating costs. The results showed a substantial saving in favor of the engines with the highest horsepower rating and higher compression ratio in the power cycling. The only two engine manufacturers able to furnish this kind of equipment were Clark Brothers, Inc., and Cooper-Bessemer Corp. As a result, approximately 60 per cent of the stations were purchased on the basis of Cooper-Bessemer Corp.'s GMW-10, 2,400-hp. unit, and 40 per cent of Clark Brothers BA-8, 1,600-hp. unit. Both of above engines are the angle type using an improved cycle, the higher efficiency of which results in improved fuel consumption and a lower heat dissipation rate to the jacket-water and oil cooling systems.

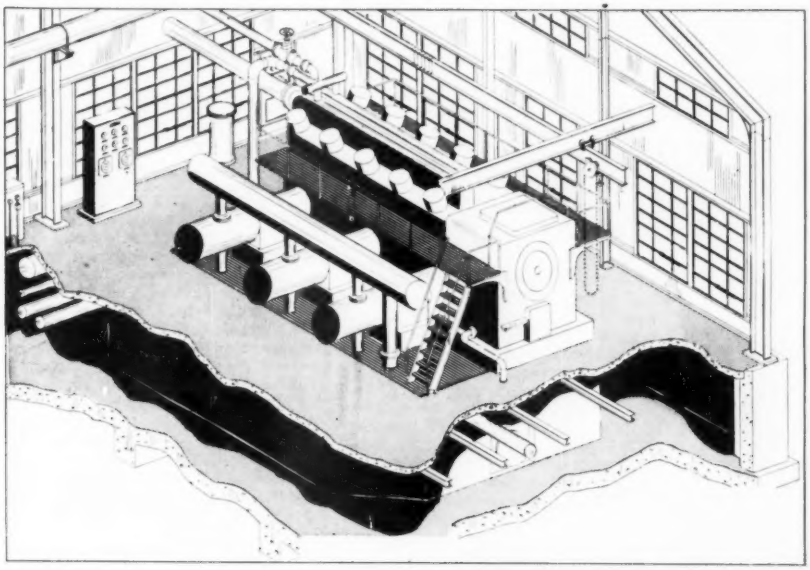
The new, high-compression-ratio engines are proportionately smaller than their predecessors due to higher efficiencies. Substantial savings were, therefore, made in building area, concrete, and installation costs. The reduction in heat dissipated, reduced the cooling-system piping, pumping, and other auxiliary facilities throughout the station.

Soil Conditions and Foundations

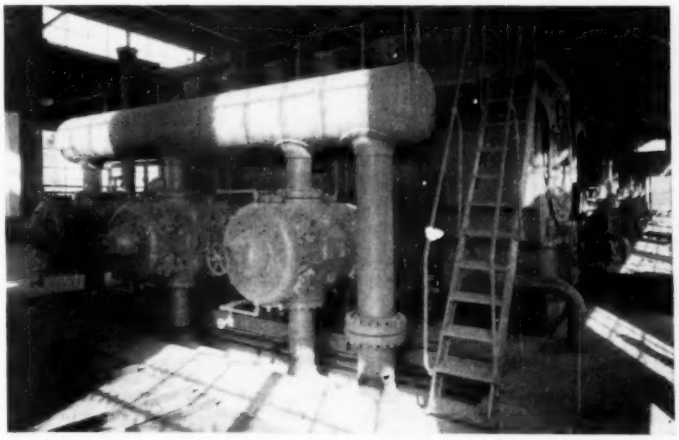
Soil bearing of some of the sites was established by checking similar



COMPRESSOR STATION AT ST. FRANCISVILLE, LA.—This is one of the first five of the 19 compressor stations on the Transco system. Spacing will be approximately 90 miles apart.



BASEMENT. — Cutaway drawing showing basement-type construction which eliminates pipe trenches and provides housing for miscellaneous auxiliary facilities.



BIG UNITS. — Setting of five 2,400-hp. gas compressors at St. Francisville station.

industrial plants in the vicinity of the station, while at others the services of an experienced testing laboratory were employed. Borings were made to study the formation under the main compressor building and other large equipment. Depth of such borings was approximately 70 ft. The test holes were made at fairly close intervals, average 60 to 80 ft. apart.

Inquiries were made in the vicinity of the station to determine whether there were any soil conditions which would present special problems. Such conditions were found to exist at the station located near the town of Orange, Va. The site was found to be underlaid by a shale with considerable soil-bearing strength. However, when the excavation exposed the shale to the air, the combination of a large amount of subsurface water and air caused it to hydrate. The result was a softening effect causing the soil to lose its bearing strength.

The unusual occurrence was remedied by capping each excavation with a concrete slab ranging from 4 to 6 in. in thickness. The regular foundations were then prepared and the concrete poured over the cap. Had this precaution not been taken it is entirely probable that some settlement of the main compressor foundations would have resulted at a later date.

An engineering study showed that the large compressor units would be more economically housed in a building with a basement. Due to the mass concrete required in engine foundations and the area over which the compressor mat must extend for low soil-bearing loads, a basement was formed without additional expense. The compressor mat covered the entire area of the main building, forming the floor of the basement and the building foundation provided the walls. The concrete foundation walls were extended approximately 4 ft. above grade in order to keep the compressor piping aboveground.

The basement eliminated pipe trenches and provided ideal housing for the engine lube-oil cooler, miscellaneous auxiliary facilities, and piping headers.

Piping Design

Due to the large gas-handling capacity of the compressors, the piping design became a problem of major importance. To emphasize this point, 1 lb. of pressure drop was found to be equivalent to approximately 40 hp. The gas scrubbers and the cooling equipment were selected for the most economical pressure drop and the connecting piping and valves sized to keep the total pressure drop within a specified limit.

Maximum pressure drop across the Transco stations was set at 10 psi. Selection of valves was limited by the size and pressure rating required. Among the types considered for this service were the venturi body and the full-opening body. The valve pressure drops were furnished by the manufacturers and it was found that a full-opening body would permit a

reduction in line size as much as two nominal pipe sizes, without increasing the over-all pressure drop across the system.

Welding-end valves were used throughout the high-pressure system, a departure from conventional methods entirely without precedent. This selection was the result of a careful study of maintenance and operation of existing gas-transmission systems. The flanged-end valves required expensive steel companion flanges, alloy stud bolts, and, generally, greater installation costs. The remote possibility of the removal of an entire valve the line, in addition to the fact that maintenance usually is confined to the internals of the valve accessible through the bonnet, were the prime factors in selecting a valve of the welding-end type.

Practically all of the auxiliary piping in the compressor station was placed aboveground on elevating pipe supports. This was considered a distinct advantage in that it provides easy access to lines in the event of station enlargement and eliminates trenching, doping and wrapping of the pipe, and backfilling. Formerly, the practice was to install all of the auxiliary piping underground. This required that large pipe trenches between the main buildings and equipment crisscross the entire station area. As a result, rainy weather would often curtail construction by turning the entire site into a quagmire.

Cooling System

Gas cooling, long a debatable necessity on main-line compressor stations, was given a careful and complete study on the Transcontinental System. It was decided that gas cooling was essential.

One of the first problems considered in selecting gas-cooling equipment was the temperature of the gas entering the station. Since there are very few data published on ground temperatures for the various sections of the country, it was necessary to secure the information by checking the records of operating gas lines.

Average summer temperatures were found to be 80° F. along the Gulf Coast; 75° F. through Louisiana, Mississippi, Georgia, North Carolina and Virginia; and 70° F. in Pennsylvania and New York. Actual tests showed that gas will approach ground temperature before reaching a station, so the above temperatures were used as the design basis.

In determining gas-discharge temperatures it was important to consider the deviation from the perfect gas laws. Horsepower and temperature calculations based on actual operating data were found to vary from the values calculated by using the normal "N" value of gas determined at atmospheric pressure and temperature.

As an example of the effect of the deviation, the "N" value was calculated from the gas analysis as 1.30. The correct value based on actual compressor discharge temperatures at 800 psig. was found to be 1.40. Dr. G. G. Brown's mollier-type diagrams were found to give very accurate results. Fortunately, the gas supply had no nitrogen and relatively little carbon dioxide to further complicate matters.

The gas-discharge temperature when compressing to a 1.45 ratio ranges from 130° to 145° F., depending upon the inlet temperature. Gas cooling was believed to be beneficial in this temperature range; however; it became an absolute necessity when a station failure was considered, and the remaining stations would operate at 2.5 to 3 compression ratios. The discharge temperature at these ratios is approximately 250° F. Operating at this temperature would cause severe stresses in the gas piping and serious damage to the line coating for a considerable distance from the station.

The conventional two-system water cooling was used on the initial stations. Atmospheric-type coils were installed in the cooling tower for gas service, with the circulating water pumped from the tower basin through a water to water exchanger on the cold system and back over the top of the tower. This provides the necessary cooling of the cold jacket water circulated through the main compressor unit and auxiliary engine oil coolers.

The hot jacket water from the power cyclinders of the main compressor and auxiliary engines is drained into a common surge tank for removal of air. It is then pumped through an air-fin-type cooling unit, the cooling range of which is from 155° to 145° F. Thus a good spread between the final water temperature and the 95° F. ambient air temperature is maintained.

A stream of hot jacket water is diverted through a small fuel-gas exchanger. This exchanger is installed in the high-pressure fuel-gas system and its function is to heat the gas before it passes through the pressure-reducing regulators into the plant fuel system. Heating the fuel gas prevents sweating of pipes inside of the buildings.

Inlet Scrubbers

Each of the Transcontinental compressor stations was equipped with a battery of wet-type gas scrubbers. It has long been the experience of operators that the only effective method of protecting compressor cylinder walls, rings, and rods is to remove pipe scales, grit, and dirt particles entrained in the gas before it reaches the compressors. This is particularly important on a new pipe line.

Water and liquid hydrocarbons are also present in the gas and, though drip pockets are sometimes installed in the low points of the pipe line, it has been found that the only effective means of removal is by the use of scrubbers.

Two types of scrubbers, the dry type and wet or oil-bath type, were considered. After an intensive investigation on the working characteristics of both, it was decided to use the oil-bath type. Actual operating tests showed that the wet unit would remove particles of a wide range in size and density, as well as low-specific-gravity liquids. This unit was also found to have an extremely wide capacity range.

That feature is readily explainable. In the oil-bath type, as the name implies, the gas passes through an annular space, mixing with the oil. During the initial operation of a pipe line, when large quantities of foreign particles are removed from the system, it is necessary to maintain a high level in the scrubber. After the line has been in operation for a period of time, the quantity of foreign material decreases. It is then possible to lower the oil level in the scrubber and increase its gas handling capacity. The limiting factor in either case is the scrubbing element which is installed in the top part of the vessel for removing entrained oil from the gas.

Buildings

The rigid frame design was selected for the main compressor and auxiliary buildings, taking into consideration the equipment to be installed, crane facilities for lifting heavy parts of the machinery, etc. This type of building permitted the installation of a bridge-beam traveling crane, with rails suspended above the eave of the building, thus holding the height of the building to a minimum. Corrugated asbestos for side walls and roof covering was installed because it is longer lasting, fireproof, and has a dampening effect on engine noise. This type of covering also provides good insulation from cold weather and summer heat.

Other buildings in the plant consist of a meter building and combination office, warehouse, shop, and change-room building. Both of these are standard sectional, truss-type buildings, with corrugated galvanized sheet iron for side walls and roof. The office portion of this building was lined and finished inside, providing ample space for the regular station operating personnel. However, larger, separate offices are considered for the stations that will even-

(Continued on page 131)

CORROSION

the corrosion engineer

Guardian OF TRANSCONTINENTAL GAS PIPELINE

The 1840-mile Transcontinental Gas Pipe Line now under construction from the Rio Grande Valley to New York will be well protected from corrosive attack, thanks to corrosion engineers of Fish Constructors, Inc., Houston, Texas, designers, engineers and constructors of the job.

Pittsburgh Coke & Chemical Company is proud to play an important part in this protection. Its coating specialists worked in close cooperation with Fish corrosion engineers in developing Coal Tar Base Protective Coating specifications for the entire line. It is the major supplier of such coatings for the North end of the line—from Chatham, Va. to Rahway, N. J.

You, too, will find *Pittsburgh* Coatings admirably suited for any corrosion need. Produced from coal tar and other ingredients originating in the company's integrated, one-location operations, the coatings contain no water solubles, have high dielectric properties . . . and can be economically applied. Your inquiries are invited.

STANDARD GRADE
Mineral filled coal tar pitch of highest quality, exceeding industry specifications.

MODIFIED GRADE
Semi-plasticized; a good, tough general-purpose coating.

PLASTICIZED GRADE
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by Walter H. Davidson

PIPE-LAYING METHODS on Transcontinental

W. H. DAVIDSON
Superintendent of Construction Transco, formerly with Fish Constructors, Inc.

SINCE the Transcontinental Pipe Line Corp. system extends from a point near the southernmost tip of the United States in the Rio Grande Valley to New York City, construction work is conducted over a great variety of terrain. Mountains have been avoided but offsetting this advantage to some extent are the problems of a large amount of swamp construction.

In the laying of the line this year in the sections through bayou country between Eunice, La., and Houston, there will be much swamp construction. The usual methods and equipment developed by contractors as a result of experience in such areas will be employed in the swamp regions.

During the laying of sections between the Mississippi River and Georgia in the second half of 1949, it was necessary, particularly in Mississippi, to deal with difficult spotty swamp conditions arising in many low areas because of the unusual amount of rain which could not be predicted on the basis of past weather records.

In addition to preparations for usual high-land operations, the construction organizations laying in Mississippi were required to interrupt normal progress frequently to handle swamp work in low places extending from 150 to 3,000 ft. This resulted in much unforeseen delay and expense. Many of the low places which normally would have presented no problems were serious obstacles because of the excessive rainfall in wide flood plains and locations subject to flash floods.

It is not anticipated that the 1950 construction will encounter as many such difficult conditions as these just described. Difficulties in the Eunice-Houston bayou country will naturally depend on rainfall. Laying in the summer may be anticipated with normal dry weather. North and east of Georgia the rivers are generally rocky and the terrain is less swampy.

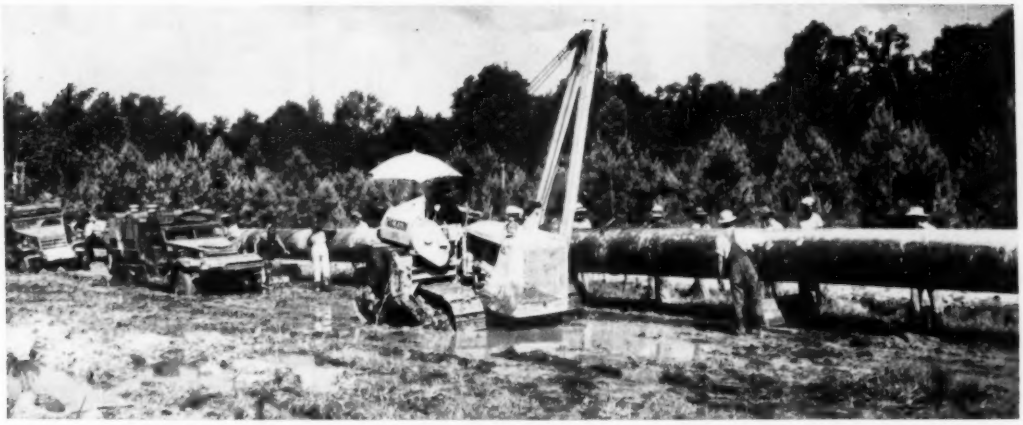
For the laying of 42,000 ft. of 12-in. for the gathering system south of Eunice, pipe will be concrete encased at the H. C. Price Co. plant at Harvey, La.

In the spotty swamp areas in Mississippi there were often quicksands and boiling sands which made trenching difficult. Much rip-rapping of the right-of-way with the use of timber was required.

Dewatering Problem

The consistency of the soil was such that at times sufficient backfill was

SWAMPS IN MISSISSIPPI.—In crossing this state, Transco-Fish were confronted with numerous swamps and flooded conditions in the "lows" of the rolling terrain. Here a gang of side-boom tractors are laying the big 30-in. pipe 2½ miles east of Bassfield, Miss.



MORE SWAMPY CONDITIONS.—Closeup of pipe handling in the swamps. Behind the side boom tractor are two half-track trucks carrying welding equipment; much tracked equipment is needed for this type of work.

not available adjacent to the ditch and the backfill was drifted in from other points. Furthermore the heavy equipment for handling 30-in. often caused the trench to cave. Because of these conditions, immediate laying of pipe had to be done close behind preparations of the ditch.

As a result of the flooded conditions in drainage areas and the high water table encountered, dewatering was a major problem. Consequently an unusually large amount of pumping equipment was used.

For these swampy spots additional pumps, back hoes, and clam shells were used. Short sections were dragged across the swampy spots by side booms after the ditch was dewatered.

Finally after the pipe was laid there were some added problems due to washing and exposure of pipe during high water, especially where streams had changed their courses and in low places adjacent to stream crossings. The stream crossings proper have been stable since they had been weighted with conventional cast-iron river clamps.

The 30-in. pipe gives more than the usual trouble because of its buoyancy. However, extensive use of clamps was not resorted to except through defined waterways. Extra depth of ditch amounting to 12 to 18-in. more than normal was utilized in several places to give additional cover to hold down the line.

In spite of the swamp difficulties the average rate of laying 30-in. pipe in 1949 was 3,500 ft. per day. Even where the spotty swampy conditions were the worst, it progressed at the average rate of 2,400 ft. per day.

(Continued on page 132)

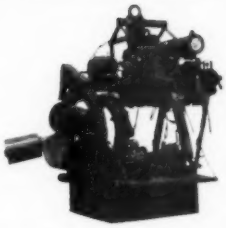
TRENCHER.—Cleveland machine digs near Spartanburg, S. C. This wheel-type unit produces trench up to 48 in. wide and 7 ft. 6 in. deep. Contractor here is R. H. Fulton.

INSTALLING RIVER CLAMP.—These heavy units were installed to decrease buoyancy in wet areas.

CHECKING WELDS.—Operator of truck-mounted X-ray equipment examines strip X-ray negative of weld.

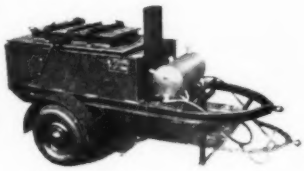
PIPELINE EQUIPMENT MATERIALS AND SUPPLIES

The 2" - 4" Crose line-traveling coating and wrapping machine illustrated is light weight and compactly designed. These features are extremely essential for proper coating of small diameter pipe. Equipped with the patented Crose coating spray ring.

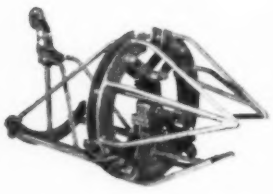


The 22" - 26" Crose line-traveling coating and wrapping machine. These machines are available for coating and wrapping pipe sizes from 2" to 34" in diameter. The positive application of coating through our patented coating spray ring gives these advantages: 1. Coats bends as well as straight pipe. 2. Applies coating to pipe that has been "egged" or bent out of shape. 3. Reduces patches on bends to absolute minimum.

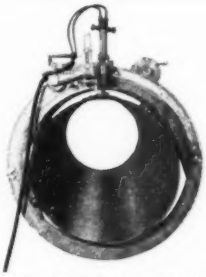
CROSE COATING STRAINERS fit all makes of pipeline coating kettles—has easily removable wire mesh filter element.



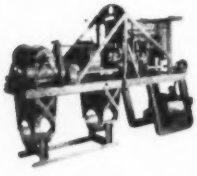
225 GALLON PATCH KETTLE is equipped with manual agitator. Available as illustrated or on steel wheels. These units are now being used for patch work and maintenance on pipelines. This unit also available in 165 gallon capacity.



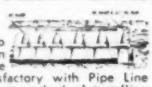
CROSE INTERNAL LINEUP CLAMPS are available in manual, electric and hydraulic models for pipe sizes ranging from 12" to 36". Crose Internal Lineup Clamps have been proven in world-wide field operations.



CROSE PIPE CUTTING AND BEVELING MACHINES—Ideal for fast, true cutting and beveling of pipe. Available in six sizes for 4" to 36" pipe. Machines for 16" pipe and above have "Out-of-Round" Attachment as standard equipment. Made of strong aluminum alloy.

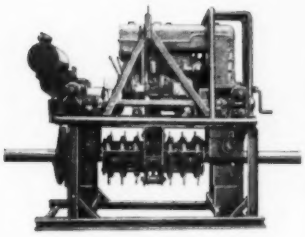


CROSE AUGER TYPE ROAD BORING MACHINE

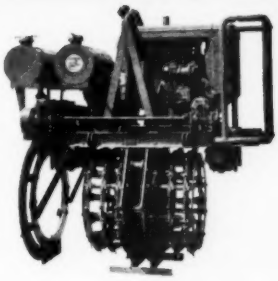


Installs pipe casing up to and including 34" in diameter. This machine has proven highly satisfactory with Pipe Line Contractors for the fastest method of installing pipe casing where rock is not encountered. Machines for installing casing larger than 34" in diameter are also available.

CROSE PIPE CRADLES handle pipe sizes from 4" to 34" in diameter. Cradle illustrated can be adjusted to cradle pipe from 16" to 26" in diameter.

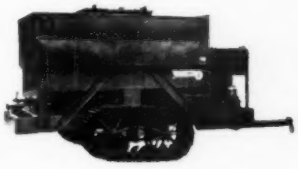


MODEL "M" PIPE CLEANING AND PRIMING MACHINE can be set up to clean and prime pipe from 2" to 14" in diameter. May be used as a line-traveling machine or on a stationary base for yard work.



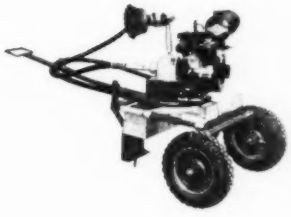
MODEL "K" PIPE CLEANING AND PRIMING MACHINE can be set up to clean and prime pipe from 16" to 26" in diameter. May be used line-traveling or on stationary base. This machine is also available for larger pipe sizes.

23 BARREL CAPACITY

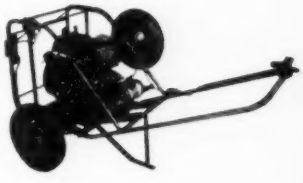


30 BARREL CAPACITY

CROSE-LITTLEFORD PIPE COATING KETTLES are equipped with hydraulically controlled agitator, low pressure burner, dial-type thermometer and a Wisconsin air-cooled gasoline engine with electric starter. If the agitator becomes fouled, the hydraulic fluid by-passes until the agitator is freed. The low pressure burner uses any type of low-grade fuel oil and distributes heat equally over all parts of the bottom. This burner is designed to avoid hot spots thereby eliminating the necessity of replacing bottoms. These completely insulated kettles may be purchased on Athey tracks or on skids for stationary coating yards. Over 150 of these kettles are in service in the United States and Canada.



CROSE PORTABLE BUFFING UNIT is used to operate sanding discs or wire wheels for cleaning stringer beads or pipe bevels.



1500 WATT SELF PROPELLED GENERATOR is a utility unit for operating wire brushes, buffers and cleaning bevels. May be used as utility light plant.

CROSE ENDLESS PIPE BELT SLINGS are stronger and lighter in weight than conventional type belt slings. No bolts or steel strapping necessary. These pipe belt slings are available for pipe sizes from 12" to 36".

PIPE WRAPPING MATERIALS — VITRON Glass Fiber Underground Pipe Wrap has been proven on thousands of miles of pipeline. VITRON Glass Fiber Underground Pipe Wrap, Asbestos Felt and Kraft Paper are all available for immediate shipment from warehouse stocks at Tulsa, Okla. or Houston, Tex.

CROSE

AUTOMATIC WELDING.—At left, the double joints (60 ft.) are conveyed on tracks from the submerged arc automatic welding equipment housed in shed. The automatic equipment is fed from pipe supply at right, where stringer beads for the double joints are manually welded.

DOUBLE JOINTING

for Transcontinental Project

by J. W. Hall

J. W. HALL
General pipe-line construction superintendent, Fish Constructors, Inc.

THE current procedure of the pipeline construction industry in the United States for yard double jointing of pipe by the automatic submerged arc welding process has been developed in little over a year. This procedure was initiated by Fish Constructors, Inc., in its efforts to improve construction efficiency.

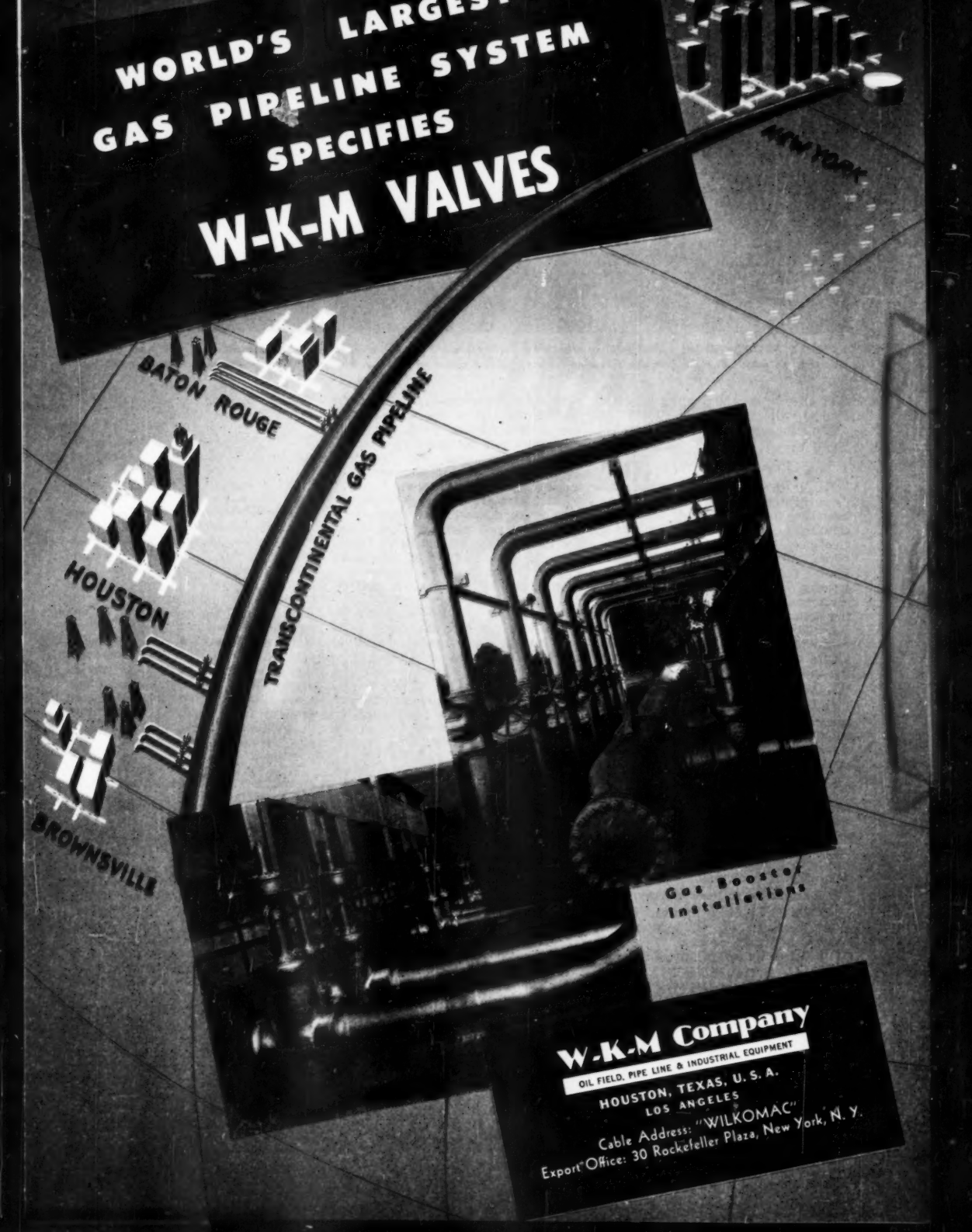
In early studies of the subject, conducted by the Fish organization, it was determined that a vitally essential need, in the present development of the art, is the running of a stringer bead by hand prior to the automatic process for completing the weld. The running of this preliminary stringer bead is now a distinctive feature of the current automatic welding for double jointing in the United States as compared with methods abroad reported to be conducted with elaborate water cooled chill-ring equipment to facilitate an all-automatic operation.

The Fish organization had an incentive for developing practical yard double-jointing procedures, because of the shortness of the 30-ft. joints being supplied for the Trancontinental line and because of the desirability of improving the quality of field welding.

The possibility of double jointing pipe at the mill was discarded for various technical and economic reasons.

In the few instances where 30-ft. single-joint installation on the line was attempted as a routine spread operation on Transcontinental, it was soon discontinued in favor of double-joint handling either by: (1) Automatic submerged arc welding in a yard or, (2) manual double jointing on the right-of-way with the use of two pipe gangs. In 1950 it is expected

ANOTHER AUTOMATIC WELDING PLANT.—Manual stringer bead work at left in shed: automatic welder at right. In center foreground are two completed joints, ready for stringing truck.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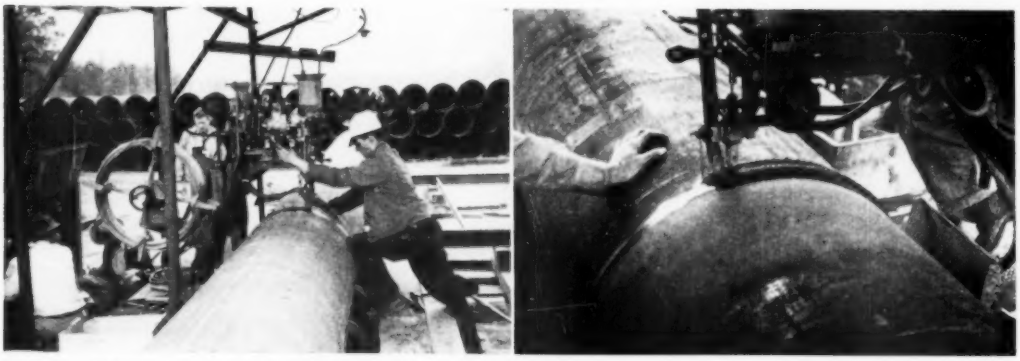

HOW IT'S WELDED.—At left, coil of welding wire is feeding over spool to final welding point; the suspended hopper feeds granulated flux to same point. At right, granular flux feed is dropping just ahead of welding wire; flux protects hot weld from exposure to air.

that all pipe on the Transcontinental project will de double jointed by automatic submerged arc yard methods.

Experimental Yards

Early in 1949, Fish established experimental yards prior to letting contracts for 605 miles of 30-in. extending east from Eunice into Georgia. Results obtained in these yards, and subsequently, demonstrated that the advantages of double jointing by submerged arc welding cannot be evaluated in terms of welding costs alone. There are important subsidiary advantages for both the contractor and the company that assure the future of the procedure in the industry.

1. **Advantages to the contractor:**

(a) Handling and hauling costs are reduced since fewer pieces are handled.

(b) Bending of pipe on the line is easier and fewer ends are damaged.

(c) Laying progress is greater since the same equipment and personnel will handle a double joint in approximately the same time as a single joint.

(d) Lower cost of actual welding due to increased production rate and flexibility of personnel.

2. **Advantages to the company:**

(a) Welds of more uniform character because of the automatic process.

(b) Better control of procedure and production.

Equipment was developed to handle the pipe at yard sites with the following characteristics:

1. Portability adapted for moving from point to point with a minimum of effort.

2. Ruggedness to withstand rough usage.

3. Simplicity to facilitate adaption to isolated areas.

4. Capacity for producing 75 to 100 welds per day.

Since pipe-handling costs are the largest element in the operating of any double-jointing yard, important economies are obtained by efficient pneumatically operated conveyor equipment in conjunction with the automatic welding machine.

Yard sites are advantageous where they make it possible to readily unload the largest amounts of pipe that are likely to arrive. Gradients favorable for gravity flow of pipe save money in handling. Furthermore, it is most economical to stack pipe no more than three tiers high.

The welding practice followed is to run a stringer bead by hand as a base for the submerged arc welding which is applied with two beads.

Stringer beads at the yards are usually run with No. 85 Fleetweld, 5/32-in. electrode; however, under certain conditions No. 5 is used. For most satisfactory results there are three stringer-bead welders, one of whom is resting while two are working.

Tests showed that the preparation of pipe ends and the application of the stringer bead was the key to the problem of getting a satisfactory weld.

After thorough cleaning and peening, the weld is completed in a specially designed rolling rig.

After determination of appropriate rotation speeds, arc currents, rod size, and composition, the automatic process produced no noticeable variations in weld quality.

From Fish Constructors' experience in operating automatic welding double jointing yards, the following operating information has been obtained:

1. Maximum production of a yard equipped with a single automatic submerged arc welding machine was 111 welds per day. Average production was approximately 70 welds per day. The usual rate of production has been 12 welds per hour.

2. Maximum peripheral speed for rotating pipe during automatic welding is 50 ft. per minute.

3. Arc current is 35 to 40 volts. Amperage is regulated between 600 to 800 amp., depending on the rotational speed.

Occasionally two automatic welding machines have been operated at one yard. But in most cases there was only one machine to a yard.

The automatic submerged arc process uses bare welding wire and through automatic operation the process achieves the highest quality of work. This method provides the fastest metal-deposition rate of any comparable welding process. There is no visible evidence of passage of current between the welding wire and the pipe but the current is carried across the gap through special finely crushed mineral material. Even when brought to the highest temperature of welding it does not give off an appreciable amount of gas and is practically unchanged chemically.

The dry, finely divided, free-flowing material is automatically deposited in sufficient depth completely to cover the end of the welding wire during the welding operation. Unusually deep fusion into the pipe metal can be obtained.

Present practices for double jointing of pipe by the submerged arc method may be regarded as only the first step along the road to making a complete automatic weld on the line. While the process, described in this article, is now economically feasible only on large-diameter pipe, it may be expected to be applicable in time to all sizes of pipe.

Efforts are being made to develop devices to eliminate the manual stringer bead entirely and make a complete weld by entirely automatic operations. Furthermore, work is being done on processes which would weld automatically stationary pipe. How soon these methods will be perfected cannot be predicted. But they are definitely on the way.

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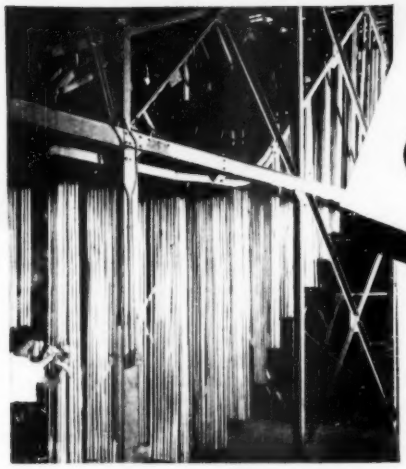

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VALVING DESIGN

on Transcontinental System

by R. D. Ricketts

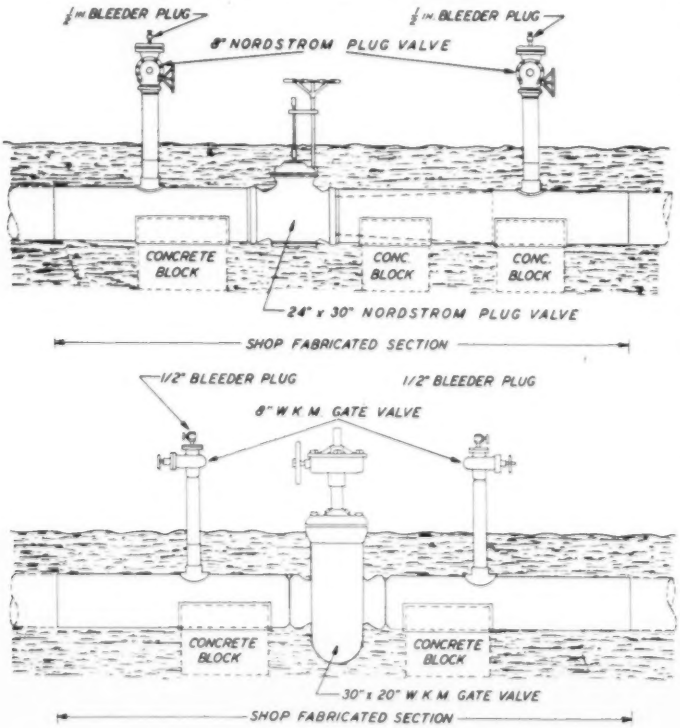
R. D. RICKETTS
Vice president, Fish Constructors, Inc.

VALVES play a major role in maintaining continuity of service in cross-country natural-gas transmission systems by providing a means of blocking off sections of the line in case of line failure and the pursuance of ordinary and normal maintenance operations with a maximum degree of convenience and safety.

The main points of consideration in determining the design for the Transcontinental Gas Pipe Line System valve blocks are: (1) possibility of line failure, (2) general terrain throughout the system, (3) probable maintenance programs, (4) accessibility of the valves, and (5) economics. As a result of our study based upon the foregoing points, the Transcontinental system will have main-line block valves at approximately 17-mile intervals. There will be installed 103 30-in. valves, four 26-in. valves, eight 24-in. valves, three 14-in. valves, and three 10-in. valves. The block valves located at the compressor stations will be W.K.M. full-opening, sliding-disk, venturi type; all others will be Merco-Nordstrom, Hypreseal type, venturi pattern, with expansion tubes on the downstream side.

Block-valve assemblies consisting of main-line valve, two blowdown valves, necessary pipe and fittings, (see accompanying drawing), are being made in a central shop. Short lengths of ½-in.-wall-thickness pipe are welded to each side of the valves, and vent-valve conections are made into the pipe. The entire assembly is stored in the fabricating shop until such time as it is needed for field installation. The vent-valve connections are left as stubs, and sufficient vent pipe is shipped with the assembly to allow an adjustment for ground elevation at each individual location. By prefabricating these assemblies in a shop, we have been able to take advantage of production line techniques, the use of automatic submerged arc-welding process, close physical and radiographic examinations of all welds, and accurate alignment of assembled parts.

***VALVE BLOCK DESIGN.**—Drawings below detail shop fabricated valve sections. These are used at 17-mile intervals on system.*

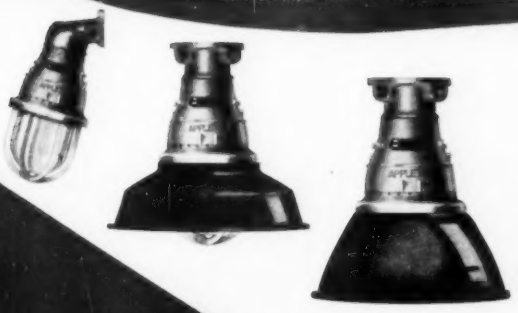


Locations of the block valves have been selected in order that the valves are readily accessible at points along the main line. In nearly all cases, the valves are located adjacent to paved or improved roads. Blowdown valves, the main valve operating wheels, and lubrication connections will extend above the surface of the ground. These aboveground parts will be protected by fences or pipe rail guards, and the valves will be locked against possible tampering by unauthorized persons.

Concrete Supports

Valve assemblies will be installed on concrete supports which will be poured in place, and special care and attention are given to the proper lineup of the valve assembly and prevention of tension or compression in the assembly from the action of the pipe. The vent valves will be flanged on one side with blind flanges being left in place to protect the valve from damage from weather when actual venting operations are not being carried on.

The W.K.M. valves, being used as block valves at the compressor stations, are reduced-area, full-opening valves with venturi throats on each side of the main disk. The W.K.M. valves have cast-steel bodies with beveled ends for welding to the heavy-wall pipe. The sliding-type disk in the W.K.M. valve operates up and down in a special-type lubricant which fills the body of the valve. In the closed position, the sliding disk is wiped free of lubricant by special rings before it is forced tightly into



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Connection block provided in canopy for line connections. No other connections are necessary.
Shock-absorbing socket.
Metal cylinder threads onto canopy, completely enclosing connection block.
Dome unit complete with large porex cylinder.
Heat-resisting glass globe is clamped in place and detaches itself from fixture when lower ring is removed.
Gaskets — One Asbestos One Aluminum.
Reflector held with three screws. Can be removed without dismantling fixture.
Guard secured with fastening screws to lower clamping ring.
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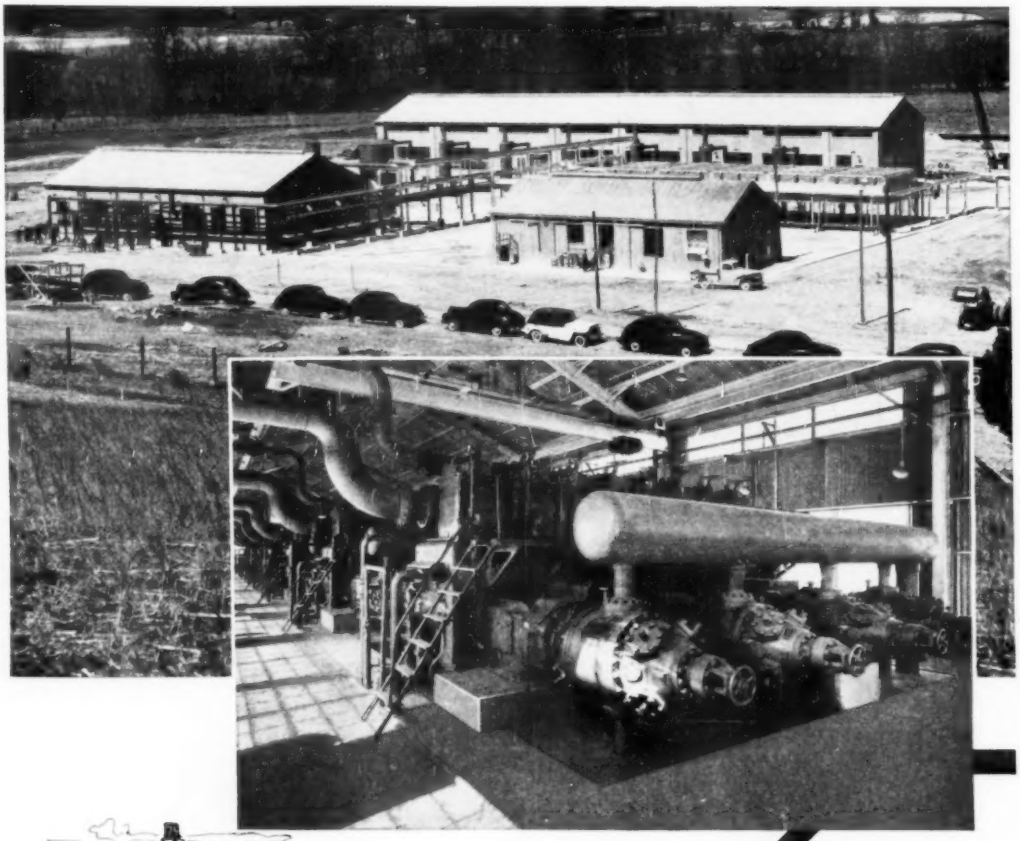

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THE NATION'S LONGEST GAS PIPE LINE

When it is completed, Transcontinental Gas Pipe Line Corporation's new Texas to New York gas pipe line will be the longest in the country, stretching 1,839 miles.

Initial capacity of the line will be 340,000,000 cubic feet per day with a potential capacity of 505,000,000 cubic feet per day.

Thousands of horsepower of Clark BA compressors are installed on this line, further proof of the marked simplicity, proved performance and dependability of the Clark "Big Angle". Available in 5, 6, 8 and 10-cylinder models of 1100-2200 B.H.P.

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position. In the open position, the disk is wiped free of dirt and foreign material, leaving a full circular opening offering no restriction to the gas flow. Due to the importance of holding pressure drop to a minimum across all valves at compressor stations, these valves were selected for use as station-block and side-gate valves.

All Nordstrom valves are Nordco steel bodies. Hypresealed type, venturi pattern. In order to reduce to a minimum pressure loss across each of the valves, Nordstrom engineers have recommended the use of an expansion tube to be installed immediately downstream of the valve. This recommended design has been made a part of the system (see drawing). Pressure drop across block valves (normally measured in inches of water) has become an important factor in the selection of valves for the Transcontinental main line. An economic study revealed that such pressure losses cannot be overlooked. Full recognition of this feature was taken into account in valve selection.

Compressor-station side-gate valves and main-line block valves are equipped with electric-motor operators. The motor drives are controlled from remote locations. The locations of the switches have been selected to provide the greatest accessibility in time of emergency. Should an explosion, fire, or other serious situation arise whereby it is of utmost importance to shut down and bleed all gas from the station piping, all the operator has to do is press a button. The motor operators close or open the valves in approximately 1 minute.

Installation of the main-line block valves is made subsequent to the laying of the main line. In other words the line is laid solid and pipe is cut out to exact length for the block-valve assembly. The installation of block valves is to be done in conjunction with the purging, blowing, and testing operation.

The 1949 construction program now completed, consisted of the installation of approximately 605 miles of 30-in. line, beginning near Eunice, La., and ending near Danielsville, Ga. No gas fields are connected with the presently completed line; however, purging, blowing, and testing operations are currently going ahead. Gas is being supplied for this operation from intersecting pipe lines.

Purging and pigging operations are being performed on a sectional basis (approximately 17 miles block valve to block valve). As the block valve is installed, the pig is inserted into the section of line ahead and the line is welded solid to the valve assembly. In sections where water has inadvertently gotten into the line, a squeegee is first inserted and run through the line to empty it of water. The cleaning or pigging operation then follows. On completion of the pigging operation, the line is thoroughly blown clean of dust, mill scale, dirt, and other foreign material not removed ahead of the pig. The downstream end of the section is then welded to the succeeding block-valve assembly, filled with gas, and the section is then ready for testing operations.

As the main line is progressively completed, cleaned, pigged, and the block valves installed, each succeeding section ends up completed and filled with gas. In this manner, the line is made ready for operation in 17-mile sections with the block valves installed and ready to use.

As a matter of interest, each 17-mile section of the 30-in. main line will contain approximately 17,000,000 cu. ft. of gas at 600 psig. The first gas was introduced into the Transcontinental system on March 12, 1950, at which time the first block-valve installations were made. The operation of purging, pigging, blowing, and testing was performed by a special crew equipped with mobile radio units for communications.

Communications were established between the meter station at the point of intersection of the Transcontinental line and the line of the company supplying gas and the crews actually performing the blowing operations. A coordinated control of the opening and closing of the valves was maintained by a constant radio contact. These operations, including the installation of the valves, will continue throughout 1950.

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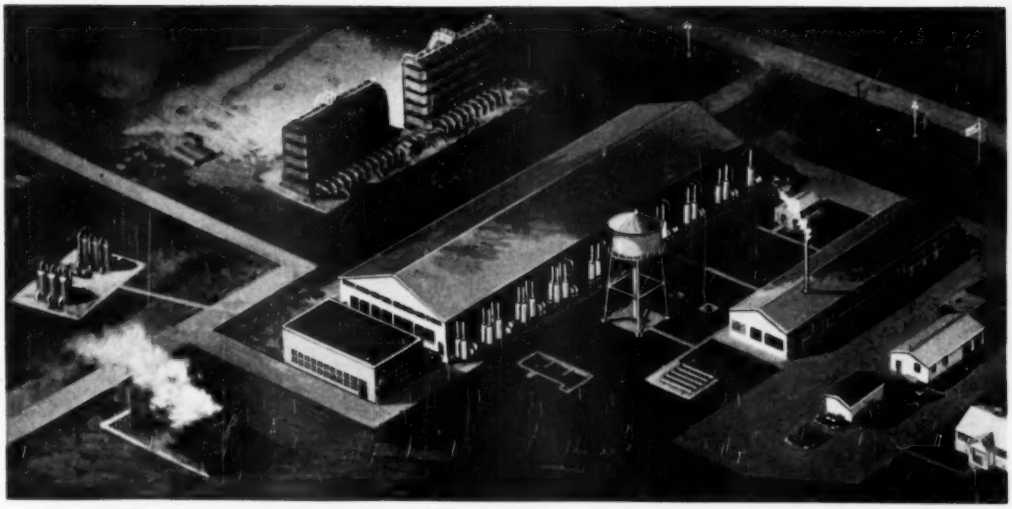

Burgess-Manning Exhaust Snubbers on gas engines of the Panhandle Eastern Pipe Line Company's Compressor Station at Centralia, Mo.

Snub the Slug and Stop the Noise

This modern compressor station of the Panhandle Eastern Pipe Line Company established a design pattern for the petroleum industry. Burgess-Manning Snubbers were selected because of their outstanding performance, rugged construction, and trouble-free service.

Noise from engines, compressors, blowers, and vacuum pumps can be prevented by using Burgess-Manning Snubbers. The Snubber prevents noise by smoothing the intake air and dissipating the energy in the exhaust gas slugs, providing quiet operation without affecting performance. Burgess-Manning Snubbers provide engine exhaust quieting in combination with high resistance to exhaust line explosion. Snubbers are ruggedly constructed and easy to install. Snubbers can also be used to control gas surging and the harmful vibration of machinery and piping produced by such pulsations. For solution of your noise and pulsation problems, consult Burgess-Manning engineers.

Close-up view of the Burgess-Manning Exhaust Snubbers used on the gas engines driving the compressors.

BURGESS-MANNING COMPANY

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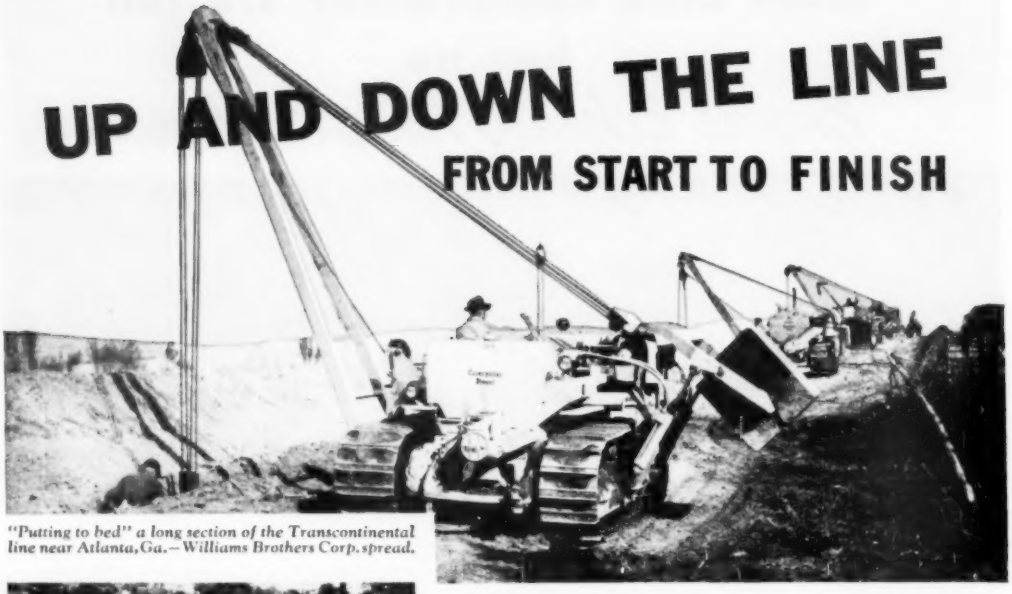
UP AND DOWN THE LINE
FROM START TO FINISH



"Putting to bed" a long section of the Transcontinental line near Atlanta, Ga.—Williams Brothers Corp. spread.

Stringing the 30-inch pipe on the Griffis-Wunderlich section of the Transcontinental line near Kokomo, Miss.

Lowering-in farther down the line on the Williams Brothers Corp. section in Georgia.

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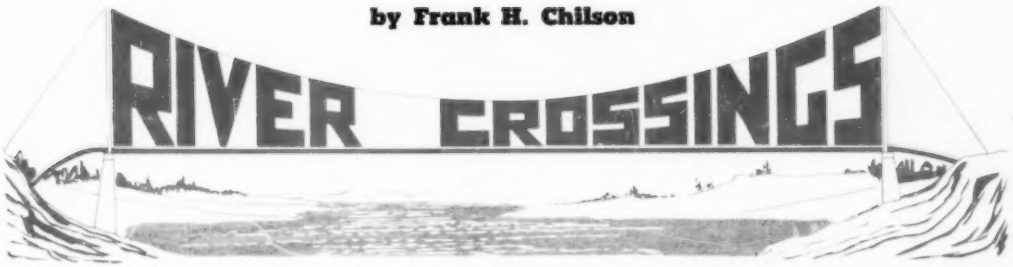
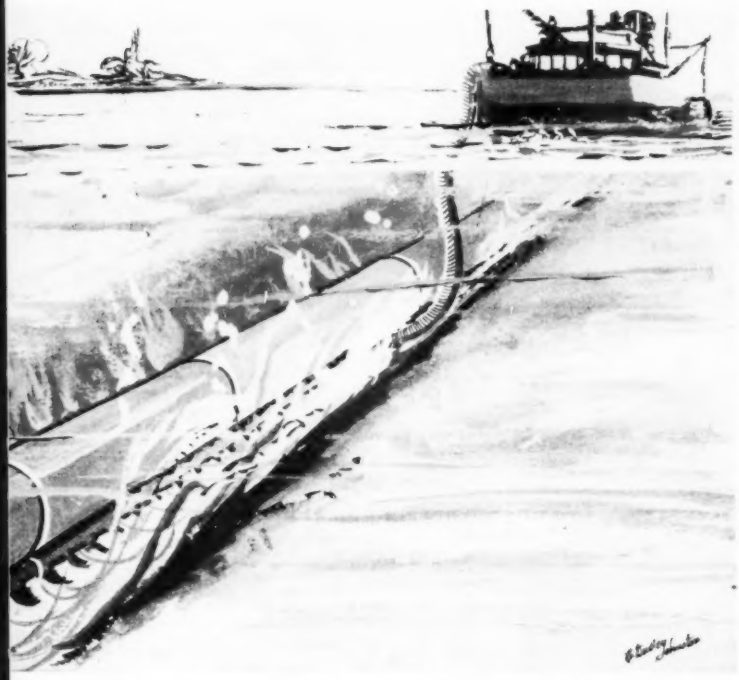
TRACTOR EQUIPMENT

by Frank H. Chilson

RIVER CROSSINGS



on the Transcontinental System



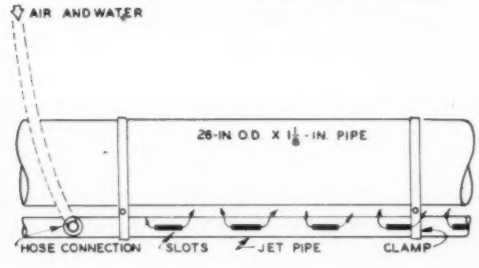
RIVER crossings play an important part in the design of a cross-country natural-gas pipe-line system. Each river to be crossed must be given special consideration as to the most economic and secure method of installing the crossing. In the Transcontinental system there are 40 major rivers to be crossed representing an aggregate crossing length of over 12 miles.

It is significant to note that the main line of the Transcontinental system terminates within the boundaries of a river. The terminal meter station of the system is to be located on a specially constructed steel and concrete pier 40 ft. offshore of the Manhattan Island side of the Hudson River in New York State.

In its route from a point near the Rio Grande in South Texas to Manhattan Island in New York, the Transcontinental pipe line crosses all of the major rivers of the Gulf Coast and Eastern Seaboard. These crossings range in length from the 250-ft. Saluda River in South Carolina to the 5,000-ft. Hudson River in New York.

In the Transcontinental system, there are 4 rivers crossed by means of aerial suspension bridges, 9 rivers crossed with multiple lines and 27 rivers crossed with single lines. The selection of the particular type of crossing is dependent upon a number

***SPECIAL PROBLEM AND SOLUTION.**—In crossing the Hudson River between New Jersey and Manhattan Island, bottom of the river consists of fine organic silt to a depth of at least 100 ft. (checked by coring). Probable penetration of ships' anchors into river bottom would necessitate that the pipe be buried at least 25 ft. Unique method of installing the 30-in. pipe will be by use of air and water jets (see drawings). The pipe is pulled into place and laid down, then jetting operations are carried on uniformly until entire crossing is 25 ft. below river bottom.*



FRANK H. CHILSON
Assistant general manager, Fish Constructors, Inc.

for economy's sake...

big COOPER-BESSEMER GMW's ON THE big TRANSCONTINENTAL LINE

Transcontinental Pipe Line Corporation's Saint Francisville, La. compressor station, containing Cooper-Bessemer 2500 hp GMW-10 Turboflow units.

● All along the huge Transcontinental pipe line, the accent is on continuous performance . . . and utmost economy! It's been that way right from the start.

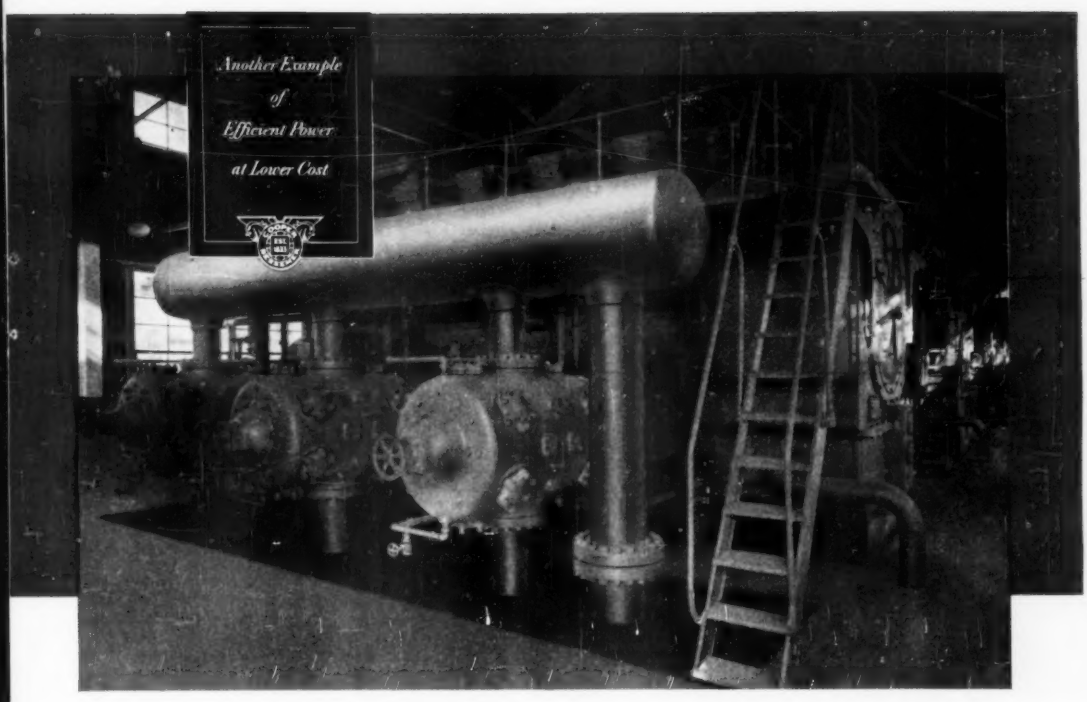
Small wonder then that Cooper-Bessemer's modern giants, GMW Turboflow compressors, are on the job . . . helping to deliver gas at the lowest possible cost per cubic foot.

For here, as on other recent lines, the *new* economies afforded by GMW Turboflows add up big! You can only judge *how* big when you weigh these well-proved gains . . .

ANGLE V

Compressors

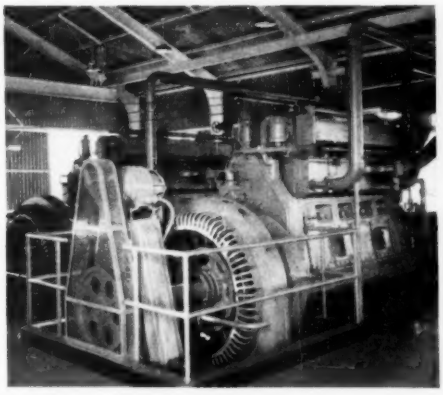
New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wash.



These five big Cooper-Bessemer GMW Turboflow units being installed in Transcontinental's new Saint Francisville station are rated 2500 hp each. Unique, recently developed features of these modern units assure new low in over-all operating cost.

a full 15 per cent reduction in "normal" fuel consumption . . . *plus* at least 10 per cent greater horsepower! So it's not only a matter of saving fuel. The over-all cost of installation, foundation, piping, housing, operation and maintenance reaches a new low . . . continues to pay off year after year. You may want to verify their savings with Fish Engineering of Houston, Texas, who are doing the engineering and construction of this line.

Whatever your compressor needs may be, be sure to check into *all* the advantages of Cooper-Bessemer V-angle Turboflows, now available from 220 to 2500 bhp per unit.



Also serving at St. Francisville are these two rugged, long-lived Cooper-Bessemer JS-5, 375 hp gas engines driving General Electric 250 kw generators for all electric power needs.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

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of factors. Generally the factors which influence the selection of each particular type of crossing are as follows:

Suspension bridge.—Used where rivers have:

1. Excess water depth.
2. Very steep and high banks.
3. Unstable bottoms subject to erosion and movement.

Multiple underwater crossings.—For rivers having:

1. Exceptionally long crossing length.
2. Locations near market area where failure of river crossing would shut off gas supply before new crossing could be installed.
3. Swift currents which might tend to cause failure in pipe of sufficient diameter to carry entire capacity in a single line.

Single underwater crossings.—Installed where rivers have:

1. Short crossing length.
2. Slow current.
3. Stable bank condition and stable bottom.
4. Locations remote from market area.

Bridge Crossings

The Coosa River in Alabama, Atchafalaya River in Louisiana, and the Brazos and Colorado rivers in Texas are being crossed with suspension bridges. These bridges are designed to carry two 30 by 0.375-in. wall-thickness pipe lines as the ultimate load. Following is a table of the physical characteristics of these bridges:

Name of river	Main span length, ft.	Over-all length, ft.	Tower height, ft.
Coosa	700	1,100	218
Atchafalaya	2,000	3,650	108
Brazos	750	1,416	86
Colorado	550	1,180	118

Atchafalaya crossing.—The choice of selection of the crossing of the Atchafalaya River was subject to considerable and extensive investigation by reason of the magnitude of the undertaking. This river is exceeding wide, swift, and deep. At the point of the proposed crossing, the water depth in the Atchafalaya River is approximately 50 ft., and a study of government hydrographs indicates that the bottom of this river is subject to severe scouring action with an indication of a possible depth at the point of crossing within a few years of something in the neighborhood of 100 ft. Such a scouring of bottom could only result in the loss of an underwater crossing unless some means were found to install the pipe below the probable scoured depth at the time of installation. This would require dredging a channel 50 ft. deep in the river bottom under a maximum of 100 ft. of water.

Consideration was given to the installation of a submerged weir type of crossing utilizing two continuous rows of interlocking sheet piling driven to a point below the probable future scouring of the bottom with the pipe laid in concrete poured between the two rows of piles. This was felt to provide a very secure means of crossing the river in an economical manner; however, the unknown effect of scouring which might have resulted from the placement of a lateral obstruction on the river bottom led us finally to abandon this design in favor of the suspension bridge even though the cost of the bridge-type crossing probably is the most expensive.

Ordinarily, a suspension bridge of the type necessary to cross the Atchafalaya River would have proved to be the least expensive of the various types of crossings except for the fact that in the Atchafalaya River bottom core borings indicated no solid foundation until a depth of approximately 130 ft. below river bottom was reached. This necessitated the installation of caissons at a great depth below river bottom and a consequent high cost in installation of the bridge.

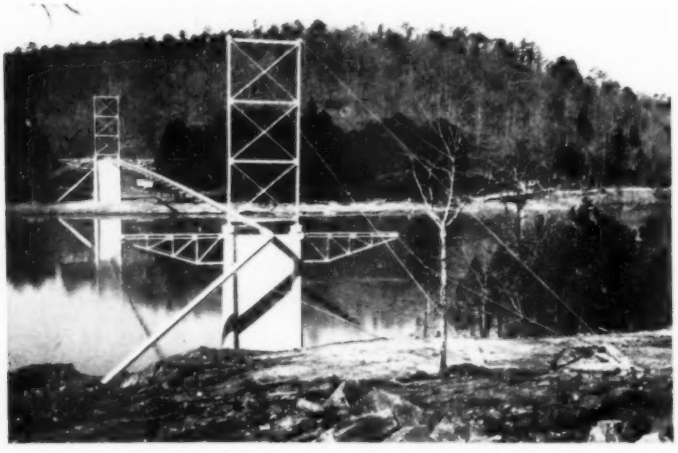
To add to the complications of making this crossing, it is necessary to relocate a portion of the main levee on the west bank of the Atchafalaya River to get proper clearance for the installation of the west caisson. To relocate the levee, it is necessary to relocate a portion of Louisiana State Highway No. 582 which parallels the levee. Another factor adding to the cost of the Atchafalaya River bridge is the extra height needed to carry the pipe line above the river level in order that there be no interference with navigation by the large vessels which move in this river. When completed, the Atchafalaya River bridge will be the longest pipeline suspension bridge on any transmission system in the United States.

Coosa crossing.—The bridge across the Coosa River was completed in March of this year including the installation of one of the ultimate two pipe lines to be carried by the structure. An accompanying photograph shows the completed structure with the pipe in place. The angular riser pipe running from the bridge down into the earth allows for both horizontal and vertical movement caused by expansion of the pipe and movement in the bridge suspension system. The bridges across the Brazos and Colorado rivers will be comparable in size to that of the Coosa River.

Other river crossings.—The Raritan, Delaware, Susquehanna, Potomac, James, Mississippi, Sabine, and Trinity rivers are being crossed with multiple lines. In each case, there will be two lines extending from headers on each side of the river with 24-in. o.d. by 0.937-in. wall-thickness pipe being installed. After careful investigation and consideration, it was deemed good engineering practice to select heavy-wall pipe for these crossings to provide uniform negative buoyancy as well as structural strength in the river pipe.

Actually, the cost of using heavy wall pipe is no more than the cost resulting from adding cast-iron river clamps to hold down pipe of lesser wall thickness, and it is felt that considerable saving can be effected in eliminating the difficulty of buoying the pipe without clamps. It is considered that extra advantage is gained in the use of the heavy wall pipe by providing added protection against

IN ALABAMA.—This is Coosa River crossing, which has tower height of 218 ft., over-all length of 1,100 ft. The Atchafalaya River bridge crossing in Louisiana is largest structure, 3,650 ft. over-all length.



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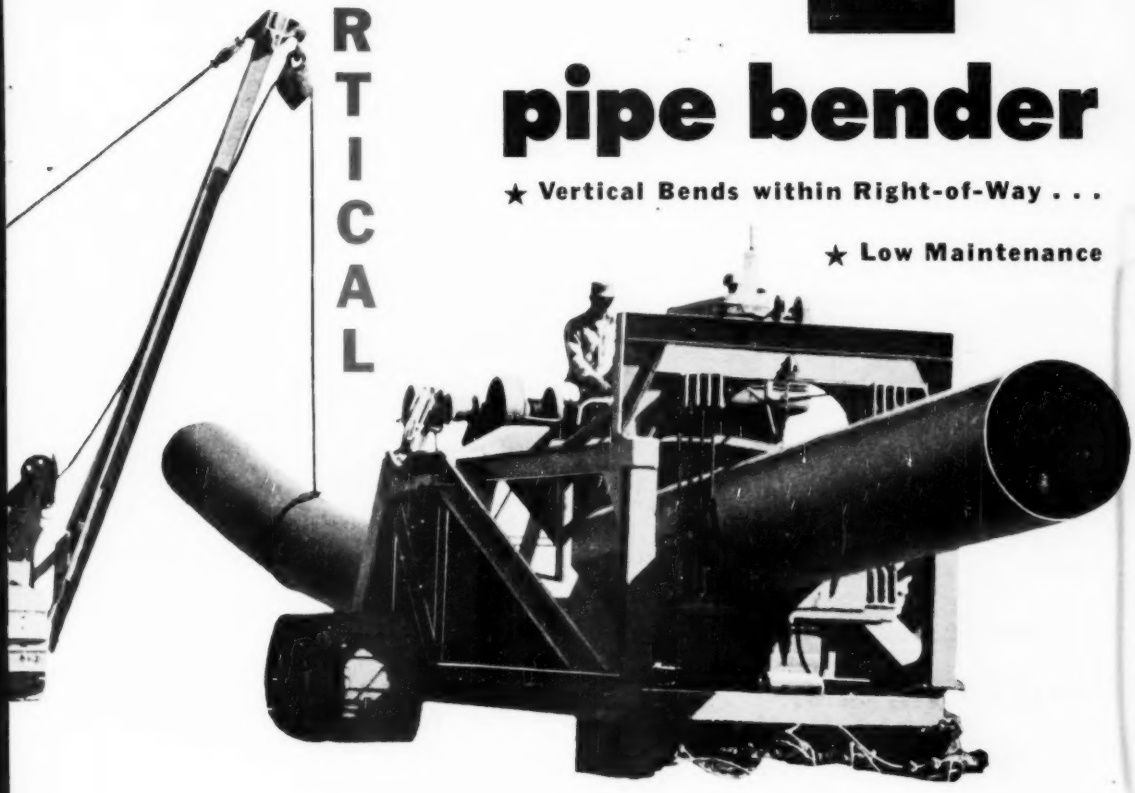

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The original machine was sent out on demonstration the first of February; it was bought, together with a second machine.

All these machines are on jobs with the 1950 construction program just beginning — proof of the superiority of this C-R-C bender.

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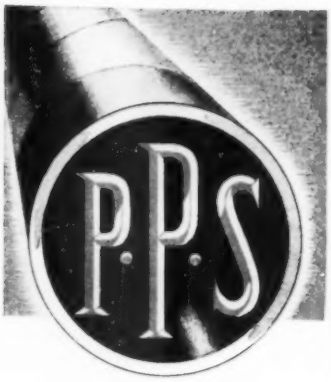

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damage to the pipe from external causes.

As a matter of general engineering design, river-crossing pipe is being installed with 10-ft. of cover in rivers with soft bottoms and 1 ft. of cover in rivers with rock bottoms. In all cases, the river banks are being cut back as far as possible to prevent possible loss of crossings from erosion and cutting of the banks.

Auxiliary crossing.—In addition to the proposed suspension bridge across the Atchafalaya River, it is planned to install an auxiliary three-line crossing to be laid on the river bottom in order to provide service continuity in the main pipe line between the source of gas supply and the eastern portion of the system prior to the completion of the bridge structure. This crossing will consist of three 12-in. lines laid approximately 50 ft. apart. This design is to allow motion in the pipes which may be necessitated in the event of severe scour to the river bottom, thus allowing the pipes to conform their profile with that of the river bottom at all times. These pipes are being laid with a means for movement in the large bend on the easterly side of the main channel to enable the lines to pay out additional length as required if bottom scouring takes place. The lines in the portion of the bend will be laid on pipe stringers which will provide a means of slippage in case the main channel deepens and the pipes have a tendency to sink to a depth below that at which they originally are installed. It is felt that this design will provide a means of maintaining these lines in what has proved to be the most difficult river of all those crossed by major pipe lines.

Hudson River crossing.—The major river crossing in the Trancontinental system is that of the Hudson River. This crossing from the New Jersey shore to a point near the terminus of 134th Street on Manhattan is approximately 1 mile wide, is in water averaging 40 ft. deep, is in an area nearly solidly built up on both banks, is in a river constantly trafficked by all types and sizes of ships, is in an area of the river where there is considerable danger to a submarine crossing by reason of possible dragging anchors of large vessels on foggy nights, and is at the delivery point of the major share of the gas being transported in the pipe-line system.

In establishing the design for this river crossing, the writer obtained hydrographs of the river bottom, ran a bottom profile at the proposed crossing alignment and had soundings and core samples taken at 50-ft. intervals across the river, and discussed the general conditions of the river silt with prominent river authorities in New York City who had gained considerable experience in their work on the vehicular-tunnel crossings.

Investigation disclosed that the river mud at the location of the proposed crossing consisted of a fine organic silt of uniform physical characteristics down to a depth of at least 100 ft. (the depth at which corings were taken), and that this silt, when wet, possessed practically no cohesion or internal friction; however, core samples indicated a considerable amount of consolidation commencing at a point 10 ft. below the river bottom and increasing as the depth increased. A study was made of the probable penetration of ships anchors into the river bottom, and it was decided that it would be necessary to install the river crossing pipe at least 25 ft. below the bottom of the river in order to provide complete security against the possibility of snagging of the line by ships anchors.

After the selection of the depth of placement of the line at 25 ft. below river bottom, the remaining problems consisted of ways and means of installing the pipe at this depth and of determining whether or not the line would have a tendency to slowly settle in the river mud or float up out of its resting place. It was decided that the pipe should have a negative buoyancy sufficient to maintain a uniform downward thrust of at least 5 lb. per lineal foot when installed at the 25-ft. below-bottom depth where the river mud was found to have a density of 90 lb. per cubic foot. The pipe selected was 26-in. o.d. by $1\frac{1}{8}$-in. wall thickness. Inasmuch as it is planned to operate this crossing pipe at a maximum gas pressure of not to exceed 400 psi. thus obviating the need for any special steel for resisting pressure stresses, it was decided to select a steel of such chemical composition as to provide maximum toughness and ductility. This pipe was manufactured by Taylor Forge & Pipe Works in its Chicago plant where each joint of pipe was stress relieved after welding and each weld X-ray inspected to provide the most selective control in its manufacture.

A special method of installing the pipe by the use of air and water jets has been worked out in corroboration with Louis Pentzien of Omaha Dredge & Dock Co., contractors for this river crossing. A small-diameter jet pipe having specially designed slots will be clamped on the under side of the river-crossing pipe and connected to water and air supplies on barges on the river surface through special hoses connected along the length of the pipe crossing (see accompanying drawing). Control of the jetting operation will be handled through specially designed automatic valves spaced uniformly along the length of this jet pipe. After the pipe is pulled into place and laid on bottom, the jetting operations will be carried on uniformly back and forth

(Continued on page 134)

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America's Foremost Pipeline Constructors

SWAMP LANDS.—Roadway constructed across boggy terrain in New Jersey. The 30-in. pipe line will be laid 4 ft. in on one side.

Eastern Section Construction

Transcontinental Gas Pipe-Line Project

by J. B. Harshman*

TO reach its customers in New Jersey and New York City, Transcontinental Gas Pipe Line Corp. was required to construct its 30-in. main line and sales laterals through one of the most highly industrialized and thickly settled areas of the United States. In addition to practically every conceivable man-made obstacle, both above and underground, nature did a fair job in adding her share of complexities in the way of rivers, small streams, swamps and mountains of volcanic rock.

This article describes engineering-construction aspects of this section of the Transco project.

The Transcontinental gas pipe line enters the State of New Jersey from Pennsylvania approximately 2 miles below historic Washington Crossing on the Delaware River. It leaves the state near the 125th Street Ferry on the New Jersey side of the Hudson River. The line emerges into New York State from the river adjacent to 134th Street on Manhattan Island.

A greater portion of New Jersey bears the marks of the great glaciers of the last ice age, leaving the state criss-crossed with many rivers and streams. The Millstone, Raritan, Rahway, Elizabeth, Passaic, and Hackensack rivers are crossed, along with about 80 smaller streams varying in width from 20 to 130 ft.

From the Delaware River to the Rahway River, a distance of 40 miles, the pipe line traverses open rolling country similar to most agricultural regions. From the Rahway River north to the Hudson, a distance of 23.4 miles, the area is thickly populated. Industrial sites and townsites are continuous with the exception of points where the line crosses swamplands which are unsuitable for factory or residential construction. North of the Rahway River the line passes through the cities of Linden, Elizabeth, Newark, Kearny, Ridgefield, and Fort Lee. Between the Delaware and Hudson rivers, 41 railroads, some having as many as 12 tracks, and 112 streets and highways are crossed.

Through the swamp areas, construction of several miles of private access roads has been necessary to provide a place on which to lay the pipe and to work construction equipment. Ground conditions otherwise would not support the weight of equipment required for the laying of the pipe. The fill material for constructing these roadways must be

(Continued on page 117)

WATER SCENE IN NEW JERSEY.—"Pulling in" the Passaic River crossing.

*Superintendent, Eastern Division, Fish Constructors, Inc.

SUPER HIGHWAY FOR GAS FROM TEXAS TO NEW YORK

15,000 CARLOADS OF PIPE like this rolled from Los Angeles, South San Francisco and Orange, Texas plants of Consolidated Western Steel Corporation to build a super-highway for gas from the Texas fields to New York City. Consolidated Western fabricated hundreds of miles of high-test pipe from steel plate for the Transcontinental Gas Pipeline Corporation's great gas carrier.

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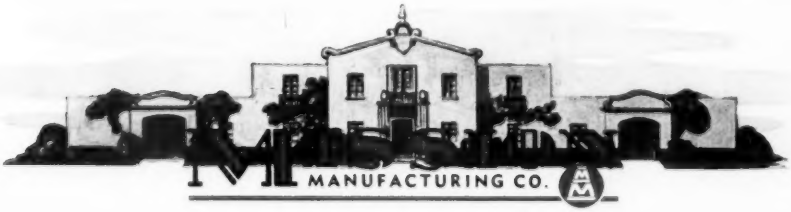

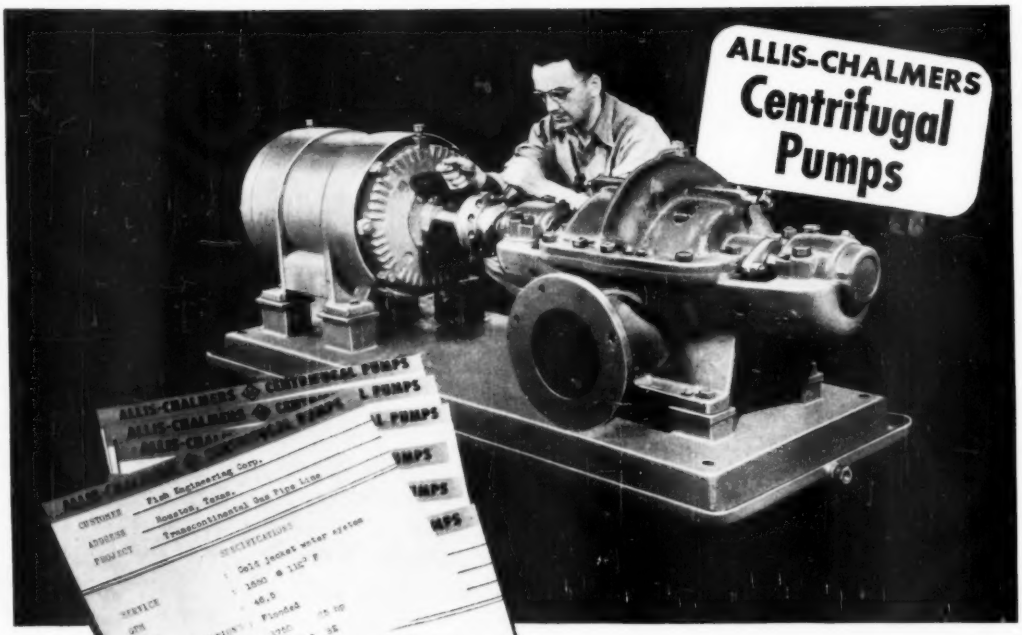

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hauled from sources several miles away. After construction of pipe line, the roadway will be used for maintenance purposes.

In this area also, the construction of bridges across more than 20 tidal streams has been necessary to permit access with construction equipment. Some of the streams involve bridges having spans in excess of 100 ft. All such streams affected by tides come under the jurisdiction of several state agencies requiring a permit from each. All navigable streams require federal permits in addition to state permits. Some streams crossed require permits from as many as five different agencies before any construction can be started.

In the Palisades area adjacent to the New Jersey side of the Hudson River, a miniature mountain of volcanic rock is crossed. The distance through this area is approximately 3 miles and represents some of the most difficult and expensive construction of the entire project. The rock is harder than granite and difficult to drill. Progress is further hampered by the fact that the area is thickly populated and only light shots can be used to break up the rock.

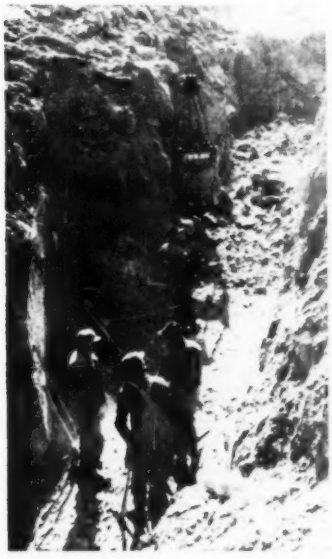
Preparatory to the design of the Hudson River crossing, the river bed was probed to a depth of 30 ft. below the bottom and at intervals of every 50 ft., to determine the location, if any, of sunken marine craft, which might obstruct the placing of the pipe at the proper depth. Borings were taken also at 500-ft. intervals and to a depth of 50 ft. for the purpose of determining soil conditions at different elevations. Mud samples were taken every 5 ft. and were analyzed in a local laboratory.

Underground facilities, such as large sewers, water lines, gas mains, and electrical conduits are numerous, and from three to five such services are found at nearly every street or highway crossing. The location, cataloging, and mapping of these facilities has been a major job.

Survey and right-of-way acquisition has also been slow and difficult. The latter has been due largely to the fact that the land is divided into small tracts and land values are extremely high. Previous surveys are not well marked, making new surveys difficult to tie in with. New construction, or planned construction in the area requires continuous contacts with the parties engaged in the work to avoid interference with each other.[3] projects. Open areas are so few that new projects such as highways, power lines, pipe lines, etc., all seemingly head for the same point.

Pipe Characteristics and Coating

The pipe used in the river crossings will vary in wall thickness from 15/16 to 1⅛-in. This heavy pipe is used to provide the necessary weight to avoid flotation instead of the conventional method involving the use



***ROCKY IN NEW YORK.**—Photo shows rock conditions in Palisades area, and extreme depth required to lay line under nearby service lines.*

STRIP MAPS
for pipe line location

Edgar Tobin Aerial Surveys - with $7,500,000 invested in completed aerial maps - is an organization of more than 300 specialists, prepared to supply strip maps for pipe line location with maximum speed - at minimum cost. Photographic and regional base maps are immediately available for over 500,000 square miles of territory. County ownership maps comprising 268,250 square miles have been completed.

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of lighter pipe and river clamps to provide the necessary weight. Between the Delaware and Rahway rivers, 0.325-in.-wall electric-weld pipe will be used, which represents ordinary cross-country construction. Near the Rahway River a regulator station will be installed and operating pressures will be reduced to a maximum of 400 psi. From the Rahway River north to the Hudson, the area is highly congested, therefore, 0.500-in. wall pipe will be used to provide a greater factor of safety. One exception is an area of approximately 5.6 miles through the Kearny and Hackensack meadows where 0.375-in.-wall pipe will be used. At a point near the Hackensack River, the 30-in. line terminates and 26-in. 0.500-in.-wall pipe will be used from this point to the Hudson River. A future lateral line will be constructed from the junction of the 26 and 30-in. line to a customer plant in northern New Jersey.

All main-line construction in this area makes use of high-tensile pipe material having carbon content of 0.24 to 0.29 per cent, and a minimum yield strength of 52,000 psi.

Between the Delaware and Rahway rivers, the main line will be coated with coal-tar enamel and a glass-fiber wrap. From the Rahway River north to New York City, both main line and sales lateral lines will be coated with Somastic.

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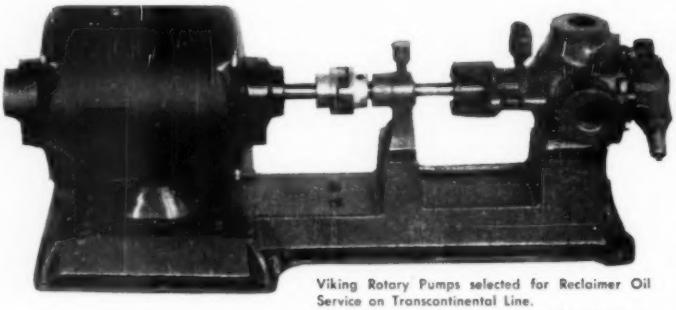

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River Crossings

The Delaware River, like many other rivers in this area, has its usual quota of man-made obstacles. On the Pennsylvania side, immediately adjacent to the bank, is the Pennsylvania Canal, an old transportation system built in the early 1800's. On the New Jersey bank are a railroad and a paved highway, between which is located the Delaware and Raritan Canal, another early American transportation system. The railroad, canal, and highway will be crossed by boring and installing casing under all three at the same operation. The point of crossing is above tidewater and its width is 1,389 ft., the bottom being solid limestone rock. The crossing will be constructed of two 24-in. lines terminating in a header on each bank. Pipe will be 0.937-in. wall, having a weight of 240.7 lb. per foot.

The Millstone River is a small stream and will be crossed with standard-weight pipe making use of river clamps to provide the necessary negative buoyancy.

The Raritan River is a tidal stream with a mud bottom except for a strata of shale rock which is encountered a few feet below the layer of mud. This stream will be crossed with two 24-in., 0.937-in.-wall lines. The river is navigable with small craft at the point of crossing and plans are under way for deepening the channel to provide for heavier craft. The lines will be laid in a trench 16-ft. below mean low-water level.

The Rahway River is a tidal stream and is not navigable at the point of crossing. The crossing will consist of a single 30-in. line with 0.500-in.-wall pipe and river clamps. Pipe will be laid at a depth of 20 ft. below mean low water to allow for future plans to dredge a navigable channel.

The Elizabeth River is a tidal, mud-bottom stream having a width of 160 ft. at high tide. This stream will be crossed with a single 30-in. line using 0.500-in-wall pipe and river clamps to provide the necessary weight. Although this stream is not navigable, plans are under way for deepening the channel for navigation at the point of crossing, and considerable dredging will be necessary to place the pipe at 18 ft. below mean low-water level.

The Passaic River is crossed at a point between the cities of Newark and Kearny. This river is a tidal stream and navigable at point of crossing with heavy craft. The width at point of crossing being 843 ft. The crossing consists of a single 26-in. line 0.937-in. wall, weighing 251 lb. per lineal foot. The 26-in. line terminates in a 30-in. header on each bank with stubs for an additional 26-in. crossing to be constructed at a later date. The line was laid at a depth of approximately 11 ft. below the bed of the river, or 30 ft. below mean low-water level. This depth of

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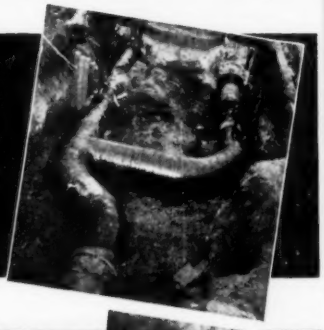

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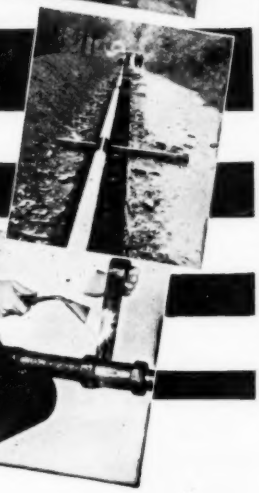

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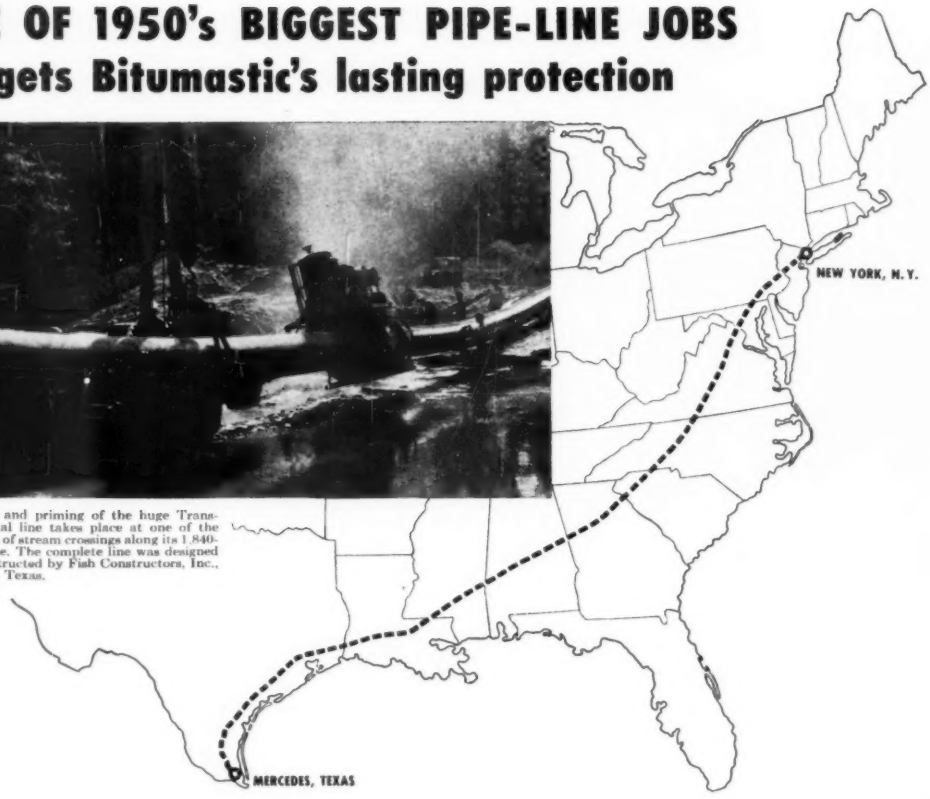

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trench to meet federal and state requirements for future channel-deepening plans. In this case, it was necessary for the contractor to haul out to sea and dump over 30,000 cu. yd. of spoils, as the dumping of spoils from dredging within the confines of the river banks is not permissible.

The Hackensack River is also a tidal stream but navigable only to small craft at point of crossing. The crossing is approximately 800 ft. from bank to bank and consists of a single 26-in. 0.937-in.-wall pipe. The pipe will be placed with 6 ft. of cover in the bed of the river, to meet federal and state requirements.

The Hudson River, by its very nature, requires some rather unusual and untried methods of construction. The original crevice or gorge of the river was some 800 ft. deep. This has, through the ages, gradually filled with soft silt. The bed of the river at the deepest point in the channel is approximately 65 ft. below mean low-water level. Borings taken as much as 50 ft. below the bed of the river failed to disclose a point where the soil was sufficiently consolidated to support any great amount of weight. To meet federal and state requirements, the pipe line must be placed at a minimum of 20 ft. below the river bed.

Tests of the river bottom indicated that due to the semifluid nature of the soil, dredging would not be practicable on account of rapid filling of the trench due to wave and tidal action. The dumping of spoils from dredged trenches is not permitted; therefore, all spoils removed from the trench by dredging must be hauled and dumped at sea, making dredging operations prohibitive and impracticable. The river crossing will consist of a single 26-in. line having a wall thickness of 1.125 in. and weighing 298.91 lb. per lineal foot. The pipe will be laid in sections with a jetting pipe attached to the bottom of each section into which will be installed jetting nozzles. A flexible hose will be brought to the surface from each section to which will be connected the jet pumps. When laying of the crossing is completed, the line will be jetted to the proper elevation in the bed of the river.

After obtaining the density of the mud, the proper weight of the pipe was determined, the idea being that the weight of the mud displaced would approximately equal the weight of the pipe. Actually, the crossing will be floating in the mud the same as a piece of wood will float in still water. The author believes this to be the only pipe-line river crossing ever designed and constructed in this manner.

On the New York side 4,220 ft. from the New Jersey shore, the Hudson River crossing terminates in a meter station to be constructed on a pier and located on the river side of the bulkhead line. Five different customer companies will receive gas deliveries at this point.

Lateral Lines

Approximately 57 miles of lateral lines, from 6 to 12 in. in diameter, will be constructed in the New Jersey area to serve 12 customer plants and requiring a similar number of meter stations. Practically all of the lateral-line construction is in congested areas and considerable street construction will be necessary. Two major river crossings are involved also in the lateral-line program.

Conclusion

Notwithstanding the fact that survey and right-of-way acquisition in the New Jersey area has been both slow and difficult, construction has proceeded on schedule. Contracts have been awarded for all main-line construction, and work is now in progress. One major river crossing has been completed and two others are under construction. Contracts for construction of lateral lines will be awarded at an early date. Eighteen bridges across meadow streams and approximately 7 miles of dirt roadway, out of the 14 miles to be constructed between Hackensack and Rahway rivers, have been built. Completion of pipe laying, testing, purging, and construction of meter stations is anticipated during the last quarter of 1950.

Controlled Odorization

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Model 26-102

Accurate control of the odorization of natural gas is a major problem facing many gas distribution companies today. The importance of odorizing gas to a known and fixed level, in order to assure its safe and economical distribution, is ever increasing with the rapid expansion of natural gas utilization.

The Consolidated Titrilog is now being used in production plants and on distribution lines to continuously record the concentration of the odorant in the stream. Thus, a constant odor level in the gas is insured and a permanent record is acquired for legal evidence of effective odorization.

The Titrilog quantitatively records sulfur compounds such as H_2S, SO_2, mercaptans, thioethers, thiophene, and organic disulfides in concentrations as low as 0.1 ppm or 0.005 grains per 100 cubic feet. Compounds of specific interest may be separately determined over a wide range of concentrations.

For complete information on the Consolidated Titrilog and other applications, such as problems in corrosion, sour-gas treating, etc., write for Bulletin CEC-1810-X9.

SPECIFICATIONS

Sensitivity The Titrilog quantitatively records oxidizable sulfur compounds in concentrations as low as one part in ten million or 0.005 grains per 100 cubic feet.

Power Requirements The Titrilog operates on standard 60-cycle 115-volt power. It requires approximately 6 amperes.

Cabinet Dimensions The Model 26-102 Titrilog is housed in a floor-mounted cabinet 66-inches high, 22½-inches wide, and 18½-inches deep. The strip-chart recording milliammeter is mounted at eye level, and directly below it is the control panel.

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Measurement and Pressure Control

of natural gas on the Transcontinental Gas Pipe Line System

by E. N. Armstrong

MEASUREMENT of natural gas to reasonable accuracy stands as a challenge to the meter engineer which must be met on newly built, all-welded pipe lines, 1,870 miles in length, if the project is to prosper as it should. Transcontinental Gas Pipe Line Corp. will purchase each day about 400,000 M.c.f. of natural gas along the Gulf Coast; will use as little gas for fuel from this volume as possible as the gas travels northeastward, and will deliver about 365,000 M.c.f. per day to customers who will be receiving gas which started from the field 3 to 4 days before. Holding the system's "lost and unaccounted for" gas to 0.5 per cent of such large volumes requires precisely designed and fabricated orifice-meter stations and constant operating attention to the metering conditions and equipment.

This gas is worth about $300 per million, at the East Coast customers' meters, so if losses can be reduced from 1 per cent to 0.5 per cent, it means saving the company about $500 per day or $182,500 per year; enough money to justify the best attention to each feature of the meter stations, particularly when all are being built new and equipment can be standardized to reduce losses to a minimum.

Three Kinds of Meter Stations Required

Purchase meter stations for about 25 points in Texas and Louisiana will measure the gas taken from producers, processing plants, and from small fields. The gas will be delivered to the pipe-line company at 1,000 psig. normally with a few deliveries as low as 800 psig. where main-line conditions make such pressure practical.

The gas will be dehydrated before it is metered and some stations will require pressure control ahead of the meters to balance pressures on gathering lines so as to accomplish ratable taking from suppliers.

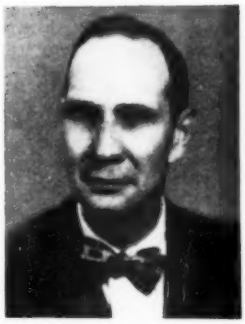
Station capacities will range from 3 million to as high as 80 million cubic feet daily.

Fuel meters at compressor stations. Fuel gas for the compressor stations will be taken from the station suction, will be heated in hot water to gas exchangers and the pressure cut from 400 to 150 psig. The gas then will be metered, and the pressure again reduced to about 30 to 50 psig. as required at the engine headers.

All gas used at each compressor station will pass through a master meter since the engine fuel makes up 99 per cent of the use. However, camp and office heating fuel gas will be measured and the pressure reduced for each residence or building where necessary. The pressure regulators and orifice-meter tubes have been designed so that the number of engines can be doubled without getting beyond the capacity of the meter station. Normal fuel volumes will range between 2,000,000 and 3,500,000 cu. ft. per day.

Sales meter stations.—Gas will be delivered to 13 customers at 21 meter stations, the major deliveries being near Philadelphia and particularly into Newark and New York City. The Manhattan 134th Street station will meter about 250 million cubic feet per day or 70 per cent of the line capacity to five New York companies at this single station, but all remaining deliveries can be made on standard dual tube stations of capacities from 3 to 65 million cubic feet per day. Pressure reduction and flow control have been agreed upon for most of the standard stations where it will assist the accuracy of the meter, or to meet customer demands.

The New York companies have contracted to receive the gas at 275 psig., and since the Manhattan station is at the end of the line, deliveries to the other customers will be at line pressure ranging from 300 to 600 psig. A pressure-control station with check metering is to be installed at Linden, N. J., to limit the pressure in the city area to 400 psig. Most of the customer companies will handle the gas at about 50 to 100 psig.



E. N. ARMSTRONG
Superintendent of measurement, Fish Constructors, Inc.

Contract Requirements to Be Met

Measurement sections in the contracts for both purchase and sale of the natural gas transported are nearly uniform as to measurement requirements. The requirements important to accuracy are:

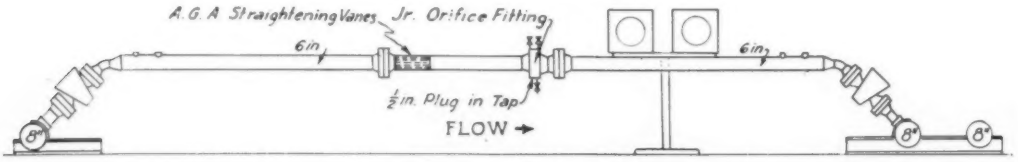
1. All gas to be measured in compliance with American Gas Association Code Committee Reports 1 and 2 of November 1935 with revisions.

2. B.t.u. of the gas must be measured daily on sales and periodically on purchases using Cutler-Hammer recording calorimeters as needed.

3. Specific gravity of the gas to be measured daily by recording gravitometers.

4. Deviation of the measured gas to be established by tests quarterly or semiannually. We plan to follow the deviation practice established on the

METER TUBES.—*Elevation detail of standardized construction.*



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Tennessee Gas Transmission Co. system, using deviation tables for correcting each daily chart and using the Burnett Bureau of Mines apparatus for testing and confirming the tables.

5. Temperature of the gas to be recorded and averaged daily.

6. All gas purchased will be dehydrated to a requirement of 7 lb. of water per million at 14.73 psia. and 60° F.

General Objective of Station Design

Designing the meter stations to serve the Transco Pipe Line under conditions outlined above can be divided into three aspects:

First—To design the **special stations**, such as the Manhattan 134th Street station where measurement of deliveries of 250 million cubic feet per day must be made. Pressure will not be reduced at this station.

Second—To design standardized "package type" orifice-meter stations using not more than two orifice-meter tubes to measure volumes from 1,000,000 to 75,000,000 cu. ft. per day, and where pressure reduction is usually required.

Third—To design a pressure-regulator assembly which can be built into the standard orifice-meter station, but so connected that it can be omitted from the station where pressure reduction is not required. The pressure control assemblies must be installed either ahead of, and separate from the orifice meters, as on purchase meter stations; or downstream and after the orifice meter tubes, as required at the sales meter stations. Pressures as high as 700 psig. must in some cases be reduced as low as 125 psig., and with dehydrated gas this can be safely done by one cut.

Special Large Sales Meter Stations

The Manhattan 134th Street station is the only one required on the Transco system where the capacity is larger than can be handled on a dual meter tube station. Measurement of 253 million cubic feet per day at pressures as low as 200 psig. required the use of 12-in. orifice-meter tubes.

The five New York companies had agreed to provide themselves with an installation of a complete check-meter station. Combined engineering study led to placing the seven 12-in. check-meter tubes immediately after each of the seven sales-meter tubes and having the entire assembly of 14 meter tubes built by Daniel Orifice Fitting Co. Thus, these sets of two 12-in. tubes have resulted in seven long (85-ft.) meter tubes on which the gas passing through any tube will be measured twice by as nearly identical equipment as may be obtained.

Check-meter results are usually of little value since all companies concerned should concentrate their attention and maintenance on the sales-meter tubes where the money is being spent for the gas, but the check station will provide a second set of charts and metering equipment which the New York companies can maintain and adjust without impairing the accuracy of the sales meters. Also, the daily charts will assist the five companies in allocating their deliveries among their several plants.

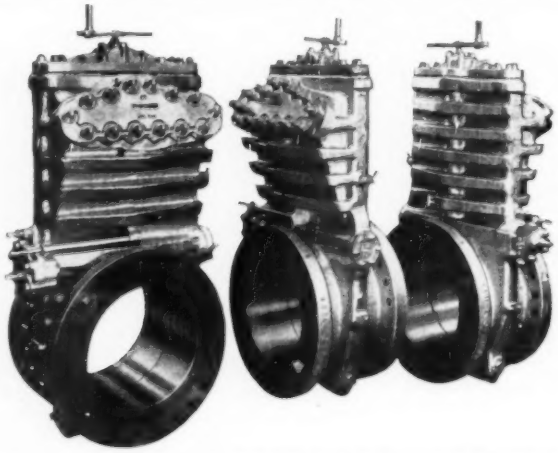
Another special station has been designed for pressure control and check metering on the main line at Linden, where four 16-in. meter tubes and four 10-in. pressure-control valves will be used with oil scrubbers to clean the gas of pipe scale and to reduce the pressure to 400 psig. as the main line comes into the cities around Newark. This station will meter up to 500,000,000 cu. ft. daily.

Standardized Meter Stations

Aside from the two very large stations, all the volumes to be measured for purchase and for sales fall between 1 and 80 million cubic feet per day and at pressures between 300 and 1,000 psig. Study of these stations and their locations developed the fact that such volumes could all be measured on dual-tube stations, and that a worth-while saving in fabrication and equipment expense could be made by adapting a standard unit-type station.

Basis for standardized orifice-meter design.—Study of the A.G.A. code es-

"Commercial" Orifice Fittings
for Large Transmission Lines



TYPE CN ORIFICE FITTINGS

Above are three 20" - 300 Lb. ASA "Commercial" Type CN Orifice Fittings ready for installation at the delivery end of the Texas-California gas transmission line. Type CN Orifice Fittings are available in sizes 2" to 20" - 125 Lb. to 2500 Lb. ASA. Other types to 30" - 125 Lb. to 600 Lb. ASA.

TYPE DSB ORIFICE FITTINGS

At left is a 24" - 300 Lb. ASA "Commercial" Type DSB (Deadline) Orifice Fitting, recently installed in a large west coast gas line. Other "Commercial" Deadline Orifice Fittings, 2" to 24", 125 Lb. to 2500 Lb. ASA.

SEND FOR 1950 CATALOG
and refer to pages 1254 to 1271
1950 COMPOSITE CATALOG

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tablishes the fact that careful fabrication and inspection of the orifice tube and frequent cleaning and inspection of the orifice disk and its fitting (or flange), is the principal subject of the code, and that if the tube and disk are precise enough to use with the published code tables and factors, the measurement results can be more precise than many think.

Hence our design was first concerned with the best possible meter tubes and a convenient supporting header system for such tubes. We found that if the daily loads and estimated hourly peaks were divided between dual meter tubes, both normally in service, that the stations required might be classified into (1) large purchases or sales, and (2) small purchases or sales.

The large delivery stations would use two pairs of 6, 8, or 10-in. meter tubes and fittings. All tubes to be of equal length and of the length required for 10-in. tubes. Such stations could meter volumes as low as 15 up to 75,000,000 cu. ft. per day.

The small delivery stations would use pairs of 3, 4, or 6-in. meter tubes, all tubes of the length required for 6-in. diameter tubes. Such stations will meter volumes from 500,000 up to 25,000,000 cu. ft. per day.

The pressure-control requirements also grouped themselves, in that the purchase-meter stations generally required pressure control ahead of the measurement and the sales-meter stations would be best with the pressure regulation downstream from the measuring tubes.

Thus we established four standard meter-station types: (1) small sales, (2) large sales, (3) small purchases, and (4) large purchases.

Standardized orifice-meter tubes.—The orifice-meter tube with orifice fitting and precisely bored disk is the key to accurate measurement when using orifice meters. Hence, all tubes are fabricated to meet or exceed code requirements. We design meter tubes in three sections, referring to them as:

1. Inlet section.—Riser valve to straightening vanes, providing 15 or more diameters or straight pipe. Diameter must be within 0.5 per cent of published diameter.

2. Vane and orifice section.—Providing 10 or more diameters of straight pipe from vane inlet to orifice disk. Diameter of this section must be held to 0.25 per cent of published code diameter. Straightening vanes are held at the inlet flange of this section and orifice fitting is welded to outlet end.

3. Discharge tube.—Fifteen or more diameters; diameter within 0.25 per cent. Thermometer wells in last diameter away from plate.

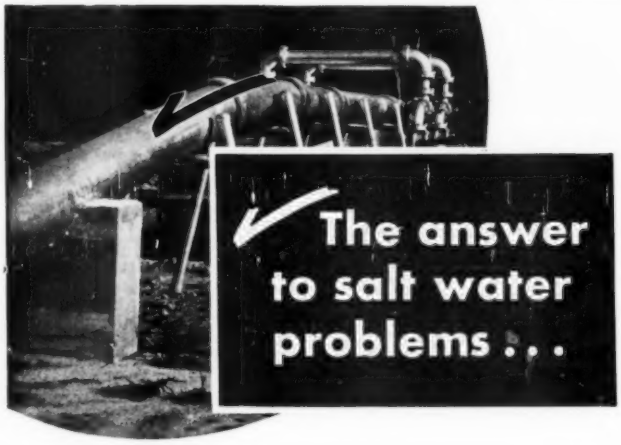
Special orifice fitting.—After discussion with the Daniel and Commercial Orifice Fitting companies, we were offered a special type of orifice fitting of the "junior" or "dead line" type. These Transco pattern fittings will be used throughout the system. They have inlet end welding, outlet end flanged. The outlet flange is necessary to make possible dismounting the fitting section to clean the vanes and micrometer the fitting from year to year.

The orifice fittings are installed to open on the side so that disk removal is easy; meter gage taps are on the top center of the run; and equally important any dirt lying against the orifice can be removed through the side opening by a small brush and good visual inspection can be had of the inside of the fitting.

The fitting company will also select pipe to the code tolerance, weld it on the fitting, machine grinding the inside of the weld to match the pipe and fitting diameter. Thus, we can expect three section-meter tubes of round, smooth character with the whole assembly made up of selected pipe with welded flanges, machined to commercial smoothness and within a few thousandths of the published diameter.

Piping arrangement.—The dual orifice-meter tubes, and the inlet and outlet headers required to connect and support the tubes set up a rectangular station basis design.

The meter tubes have 45° ells at both ends, fitted onto the standard-sized valves in the 45° risers coming up from the headers. The meter tubes



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Use Transite Pipe to save on installation . . . to reduce maintenance . . . to eliminate frequent costly pipe replacements on your salt-water disposal lines. For all the facts, write Johns-Manville, Box 290, New York 16, New York.

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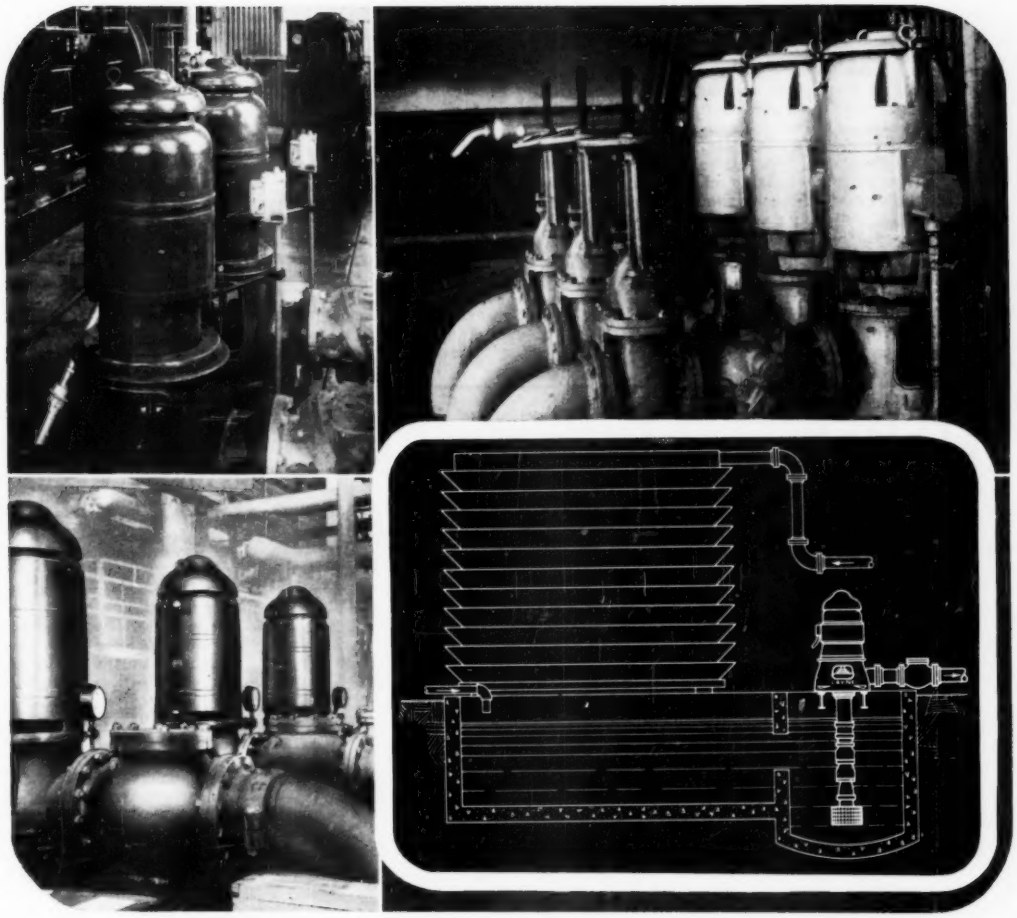

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can be lifted off the valves without strain when inspection is necessary. The headers are welded into two structural I-beam rails which rest level on the floor and take the place of any concrete piers, while holding the riser valves at the 45° angle. The meter tubes are laid out on 10-ft. centers and the large type stations are 45 ft. in length. This spacing made practical the design of the standardized pressure reducing valve assembly.

The large stations will have 6-in. inlet and outlet valves, although 6, 8 or 10-in. meter tubes will be used on these stations. This makes a nice saving on valve cost, and makes practical the use of venturi throated plug valves. By having the valves around one turn away from the straight run of the meter tube and also by having 25 diameters ahead of the orifice plate, use of two 6-in. valves on 12-in. headers divides the flow between the tubes.

The small-type stations have 8-in. headers, with 3-in. riser valves on which 3, 4, or 6-in. meter tubes can be used, but the base plan is the same as on the large type station.

A standard pressure-control assembly.—The pressure-regulator assembly makes use of two headers, one at 90° to the meter header, to which it connects, and the other header is parallel to the meter header. Thus this header arrangement can be set into the inlet or discharge end of the meter rectangle and will position the regulators near the flow-recorder instruments.

We found that the large-volume stations would normally use 3, 4, or 6-in. regulators, so we selected 4-in. hand valves for standard, and as we wanted one control valve in service and one standby we planned the two valves on 45° turns so mounted on a central support header as to enable the valves to be free of the floor and set in a relatively long run of piping between the two hand valves with swedges into and out of the regulators when needed. Thus, one regulator and pair of hand valves serves as a bypass for the other regulator when one is being cleaned.

Operation Features

The standard station design incorporates 45° turns wherever possible to minimize vibration and to reduce turbulance, noise and pipe strain. Design arrangement is such that any meter tube or pressure regulating valve can be lifted out of its flanges without strain on adjacent piping on which there will be a high pressure. Gas leaving the pressure-control valve will pass straight away into the pipe line with only two 45° turns, yet the valve is up off of the floor, properly supported by the piping and may be easily cleaned by removing either bottom flange or topwork. The central header piping to the control valve post will serve as a mount for pressure and flow-control instruments.

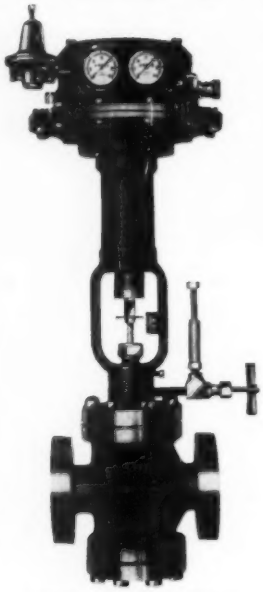
Meter-tube headers are connected to the control-valve assembly by flanges. When a station delivers gas to a pipe-line customer where no pressure or flow control is desirable, a tie-over assembly can be installed, so designed as to connect the dual headers and to allow the reclaiming of all the pressure-control valves so that this tie-over assembly reduces the cost of the setting to about the same price as a plain metering station. More important, if future experience shows the pressure-control equipment necessary, it can then be installed without piping changes.

The pressure-control assembly, dual diaphragm valves with four hand valves, is installed between the meter tubes, not beyond them. This arrangement reduces the building length, but more important, it places the pressure pilots, usually standard mounts, on the pressure-control valve adjacent to the flow-metering instrument.

Floor space between the runs at the front of the house, about 7 ft. square, makes an ideal place for meter-maintenance men to work. The instruments are facing each other between runs, on separate stands, so are quickly accessible to the chart changer. There are no meter tubes to climb over and easy access to the building is had by doors at both ends.

The natural-gas industry has stand-

FISHER'S 2,000,000th REGULATOR GOES ON THE "LINE"



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Regulator Serial No. 2,000,000 will be installed in Texas at one of the many dehydration purchase stations. Fisher regulators also control compressor fuel gas along the Transcontinental line from Texas to New York.

Fisher Governor equipment on the Transcontinental pipe line was engineered by and purchased through Puffer-Sweiven Company. Complete engineering and warehousing facilities maintained at Houston and Corpus Christi.

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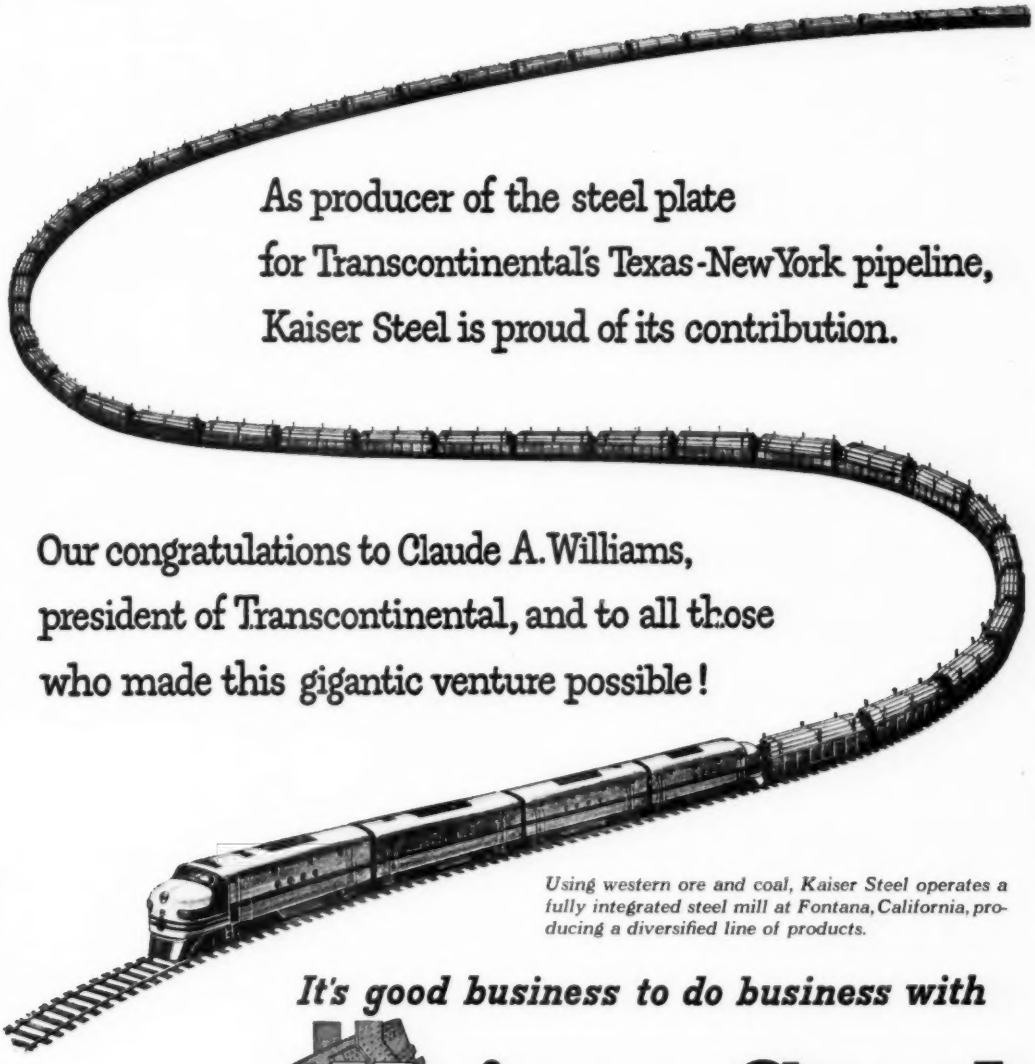

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Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	8⅝" to 22" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅞" to 12¾" O.D.	Up to 55'	.188" to .400"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	24" to 30" O.D.	Up to 40'	.188" to .500"	Napa, Calif.—Basalt-Kaiser

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ardized for new construction on pilot-operated pressure-control valves, made of steel, with interchangeable valve and seat assemblies that can be changed to meet flow conditions. Thus, we are installing some 3-in. valves with 2 or 1½-in. valve-and-seat assemblies, with the intention of inspecting these valves by complete disassembly every 6 months or oftener. Hardened-steel trim eliminates much of the concern about cutting out valves in service.

Single-seat valves are widely used on the high pressure control work in Texas and this practice will be applied to our intermittent service station, such as electric-generating stations where deliveries may be made several weeks apart, as weather and preferred use require. Single-seat valves give tight shutoff between sales.

A new pressure-control valve is being tried now, which has a circular rubber-tube assembly that is pilot operated to insure tight shutoff. These valves are not as sensitive on opening as the regular steel type, but do provide smooth flow pattern through the valve and the arrangement of the pilot will use full upstream pressure on the rubber for tight closing.

Any new line will deliver some water vapor, so that we are expecting and preparing for temporary regulation trouble for the first 90 days. We expect to use methanol as a deicing agent, mixing the alcohol vapors, or even liquid, into the headers at the pressure-control valves. This should break the hydrates out of the valve bodies enough to permit the valve to operate. Of course, the alternate valves may have to come into use during this time, too, to permit shutting out a valve and cleaning it, or perhaps heating it with steam to free the valve and seat.

When our gas, as purchased on dehydration specifications, with dew points well below zero, reaches the sales stations there no longer will be concern about regulators hydrating. These conditions may be reached in a few weeks, or it might be several months before the 1,868 miles of 30 and 26-in. pipe gets really dry. After that time, good stuffing-box lubrication, clean pilot regulators, and tight shutoff will be our principal concern.

Irregular Flows at Gas Plants

Most of the customers of the Transco system will use the natural gas for blending, enriching, and reforming in their present manufactured-gas plants. Roughly, half of the natural gas delivered to the gas plants will go into cycling flows at water gas sets which are operating on 3 to 7-minute cycles. These cycling flows are at low pressures of only a few pounds.

Measuring deliveries having such widely changing flow rates will not be accurate even when taking advantage of the higher line pressures, unless the meter station includes a flow-control instrument and valve to average hourly take, and by widely varying pressure in a tank and the connecting piping to take care of the surge volumes by pressure changes beyond the meter station.

Equipment to stabilize flows by using two separate valves is successful, but we are planning an additional saving by combining the pressure control valve and the flow-control valve and entrusting the double duty of pressure control and flow control to a Foxboro "Auto-Selector Stabilog" which is being used successfully for a similar service at Humble Oil & Refining Co.'s Katy plant and at other processing plants on the Gulf Coast.

This dual instrument will eliminate the possibility of hunting two valves when pressure-control valves and flow-control instrument and valve are used separately.

Field Construction

The standard meter stations will be assembled, as to meter tubes, headers, and all piping and valves at the Southwest Welding & Fabricating Shops at Houston. Here the assembly will be checked for fit, and pressure tested to 1,000 psi. The stations will then be disassembled and shipped to Fish Constructors' warehouses.

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work for the setting and buildings will be completed by local contractors. Then, company crews can truck the shop-fabricated meter station units to the site, and by simply bolting the flanged sections into place, have a completed meter station ready for service.

Station and Plant Design

(Continued from page 88)

tually become division points of the system, where pipe-line maintenance personnel will be stationed.

Future Compressor Stations

Design of the future stations, now before FPC for approval, is complete. All of these stations, with the exception of four, will deviate slightly from the existing stations. The changes are in the cooling systems. Compressor stations Nos. 5, 7, and 10 will be a centrifugal type with steam-turbine drive. Compressor station No. 19 will be reciprocating engine type with power for auxiliary cooling and pumping equipment taken off the engine shaft through a hydraulic drive system.

The changes in the cooling systems of the future stations were the result of past difficulties in obtaining water in sufficient quantities at the location. As a result, air cooling was employed for gas and jacket-water cooling on all stations east of the Mississippi River.

Compressor station No. 5, located near Eunice, La., was selected as the ideal location for installing centrifugal compressor units with steam-turbine drives. Ample supplies of water and moderately priced fuel gas made it attractive for this type of installation. The installation will consist of two 4,000-hp. units installed in series to produce a 1.5 compression ratio. Each unit will be driven by a condensing-type steam turbine. Standby equipment will not be necessary since either of the compressors can handle approximately 95 per cent of the normal load. This is accomplished by speeding up the operating unit, sacrificing some efficiency.

The auxiliaries required at station No. 5 include two boilers, each capable of generating 40,000 lb. of steam per hour. The electric power required for the station will be generated by turbine-driven generators. The exhaust steam from the turbine is used in the boiler-feed deaerating heater. The design as now planned promises an exceedingly simple and compact station arrangement, requiring the very minimum operating personnel.

Compressor stations 7 and 10 have also been selected for installing centrifugal compressor units with steam-turbine drives. However, final plans for making these stations the centrifugal type are contingent upon obtaining a satisfactory water supply at the site.

Compressor station 19, located near Baltimore, was selected as the ideal location to use a hydraulic system to drive the air-fin cooling units and the compressor jacket-water pumps. Thus the station electric-generating equipment was eliminated. The small amount of line power required for plant lighting and other miscellaneous uses will be purchased from local supply. The individual air-fin cooling units for each of the seven 1,600-hp. compressors contain separate sections for both gas and jacket-water cooling.

A complete study of the latest schemes for utilizing power from the main compressor units was made and, while all of the methods considered have merit, the hydraulic drive was chosen. The hydraulic drive permits the cooling units to be located a distance from the compressor building. This is a very important operational factor since it cuts down noise and heat and leaves all of the compressor-building aisles unobstructed. A complete range of fan speed is obtained by bypassing the hydraulic motor.

The hydraulic drive system consists of a combination hydraulic pump-gear increaser connected to the

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compressor engine shaft through a nonreversing coupling. The pump circulates low-viscosity oil to hydraulic motors located at the air-fin cooling unit and the compressor-engine jacket-water pump. The return oil from the hydraulic motors is piped back to a surge tank in the compressor building, from which the hydraulic pump takes suction. Cooling of the oil is effected by radiation of heat from the return line.

Dehydration Plants

Fifteen granular - desiccant - type plants will be required to dehydrate the initial gas capacity of the Transcontinental System to a 25° F. dew point. The units will range in size from 5,000 to 30,000 M.c.f. per day capacity.

The general design of the dehydration plants consists of two contactors, the cycles of which are to dehydrate and regenerate alternately on 8-hour periods. The regeneration cycle consists of bed cooling, as well as a regeneration cycle.

A 7-day hand-wound time-cycle controller switches the towers automatically every 8 hours. A flow-control valve and a differential pressure valve regulate the amount of gas used for regeneration and maintain a sufficient pressure differential to permit the regeneration gas to enter the dry gas stream if desired. Regeneration-gas cooling is accomplished by the use of a gas-to-gas exchanger installed in the dry-gas line. Thus the units are completely automatic with only periodic operational check-ups required.

The units will be prefabricated at a central location and the equipment and piping assembled on a two-section skid base. The sections will be hauled to the field and the interconnecting piping assembled. A direct-fired gas heater will be installed, insulation applied, and other minor additions made prior to startup.

Pipe-Laying Methods

(Continued from page 91)

The highest average rate was 5,100 ft. per day at the western end.

Progress for all work done in 1949 on the 605-mile, 30-in. line eastward from Eunice is indicated by Table 1.

Construction Methods

Routine construction methods are outlined below in the order in which they are dealt with in spread operations.

Right-of-way.—Width normally cut to 75 ft. except in wooded areas where it is reduced to 50 ft. In 1949 the route traversed was 65 per cent through timber. There will be a smaller percentage of timber along the route of sections laid in 1950.

Ditching.—For 30-in. pipe cover is normally 30 in. In rocky ground cover may be 24-in. minimum. Normal ditch width is 42 in.

Contractors have the option of applying rock shield or cushion board as a substitute for dirt padding across rocky ground.

Welding.—Both the 1949 and 1950 programs call for No. 5 Fleetweld stringer beads, No. 85 filler, and No. 5 cap.

X-ray examination of welding is conducted by a plan for sampling the work and for providing a guide to aid in welding control to augment visual inspection. All welds are X-rayed at river crossings and in the section near the Hudson River in the Edgewood, N. J., area.

Bending.—Either smooth or wrinkle bending is specified for all work in 1950, at the option of the contractor. Smooth bending is more generally used and has been very satisfactory.

Double jointing.—The automatic submerged arc method, discussed in another article in this issue, has proved to be very satisfactory for giving better control of welding and for facilitating bending. Advantages of laying the longer 60-ft. joints are obtained with no additional stringing problems.

Coating.—This operation is made with the usual cleaning and priming steps ahead of the application of hot coal-tar enamel and glass-mat wrapping. Excellent coating results have been obtained. At river crossings there has been some wrapping with asbestos felt in addition to double coating with enamel and wrapping with glass mat.

Holiday detection behind the dope and ahead of lowering in is required. Contractors make a general practice of using one jeep behind the dope and another just ahead of the lowering in.

At 1-mile intervals corrosion test leads are installed. Special protective measures are adopted in certain areas where the line is crossed by electric railroads.

Back filling.—Specifications require that brush and timber not be allowed in the back fill. Height of back fill is limited to 24 in.; in cultivated fields it is somewhat lower. Where the pipe line traverses marginal land which is badly eroded, special care is given to terracing and the restoration of terraces to prevent soil from being washed away.

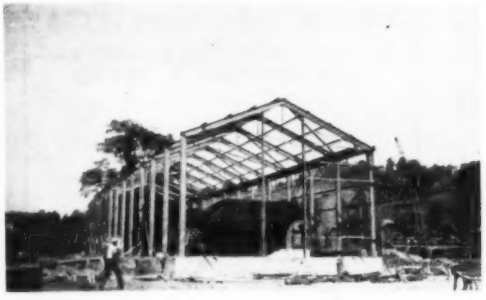
Spans.—Both supported and unsup-

TABLE 1—1949 CONSTRUCTION RATES IN MILES PER DAY

Schedules	Operations				
	Clearing	Stringing	Welding	Coating	Lowering
1	1.490	.966	.955	.820	.800
2	1.071	.930	.970	.978	.955
3	.504	.474	.467	.457	.443
4	.943	.814	.754	.765	.777
5	1.195	.761	.621	.609	.617
6	.747	.690	.636	.634	.613
Avg. day	.992	.772	.734	.710	.701

ANTICIPATED 1950 CONSTRUCTION PROGRESS

Schedule location—	Daily rate of lowering in in miles	Total days lowering in
Texas A	1.00	80
Texas B	1.00	150
Texas C	1.00	115
Texas D	.66	138
Louisiana E	.66	122
Georgia-S. Carolina 7	.66	125
S. and N. Carolina 8	.69	123
N. Carolina-Virginia 9	.70	142
Virginia 10	.66	124
Virginia 11	.72	153
Maryland 12	.66	117
Pennsylvania 13	.60	141
New Jersey 14	.37	110



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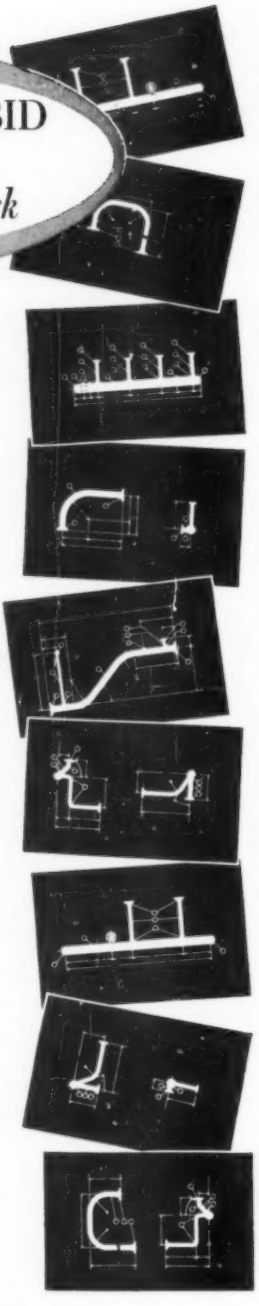
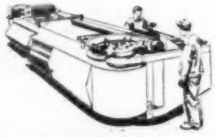


The Manufacturing Division of The Fluor Corporation, Ltd., has expanded its facilities for pipe prefabricating services to the Oil, Gas, Chemical and Power industries. Advantages to the customer are many:



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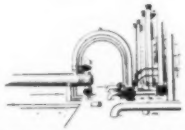

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ported type spans are used in rough country where feasible. Maximum unsupported spans for 30-in. pipe are 85 ft. in length. Selection and installation of spans are directed by company engineers. No span is installed with clearance under 10 ft. A general survey of drainage areas is conducted prior to the spanning of any ravine or gulley.

Canals and major drainage ditches are spanned when possible in order to eliminate future maintenance problems which might result from later deepening operations.

The 30-in. pipe for the project is manufactured to four wall thicknesses as follows: (1) 0.3125-in.—used most extensively; (2) 0.325-in.—installed for a distance of 20 miles on the discharge side of each compressor station; (3) 0.375-in.—for all highway and railroad crossings and for a minimum distance of 2,000 ft. across each compressor station location; (4) 0.500-in.—for single lines across medium and major rivers.

Furthermore it should be mentioned that 0.375 and 0.325-in. wall thickness pipe is laid in hazardous areas.

Minimum yield point of the plate utilized for making the pipe is 42,000 psi.; ultimate tensile strength of the expanded pipe is 72,000 psi. Minimum yield point for pipe including ⅜-in. wall thickness is 52,000 psi.; for ½-in. pipe the minimum yield strength is 46,000 psi.

River Crossings

(Continued from page 110)

across the river until the entire crossing length is let down to the desired depth of 25 ft. below river bottom.

Laboratory tests have shown that as the river mud is lubricated by the addition of water and agitated by the addition of the air, the main pipe will tend to sink to the proper depth by reason of its own weight, and, after reaching the proper depth, will maintain a firm position in place after consolidation of the river mud which is expected to take place within 2 or 3 days after the completion of the jetting operations.

It is planned to weld this pipe into a continuous line on a long series of barges along the west bank of the Hudson River using an automatic submerged-arc process. Each weld will be inspected by X-ray and the line will be pressure tested prior to being lowered into the river. The entire line will be coated with a ⅝-in. thickness of Somastic coating.

The following contractors have installed or are installing river crossings on the Transcontinental system: Austin Bridge Co., American Bridge Co., Kansas City Bridge Co., Massman Construction Co., Pittsburgh-Des Moines Steel Co., Omaha Dredge & Dock Co., L. E. Farley, Inc., and Anderson Brothers Corp.

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Natural Gas Only Segment of Industry Still Facing an Unsatisfied Demand

by John C. Casper

NATURAL gas still has several more years left in its postwar expansion program. Gas-transmission-line construction is about the only segment of the petroleum industry that is working under pressure because of unsatisfied demand. It has been estimated that gas pipe lines, now under construction or projected, will increase the availability of natural gas by more than a trillion cubic feet per year by the end of 1953.

The delay in supplying the backlog of natural-gas demand has been due to the fact that long lines were needed to link the high-reserve areas with the industrial and densely populated sections in the North and East. The southern and southwestern areas, including Texas, Louisiana, Kansas, Oklahoma, New Mexico, and Mississippi, have about 89 per cent of total gas reserves in the country but potential demand is greatest in northern and eastern states.

Production of crude and natural-gas liquids reached a peak in 1948. This was followed by a year of readjustments when total liquid-hydrocarbons production dropped about 7.5 per cent. In contrast, utility sales of natural gas in 1949 represented an increase of 9 per cent over 1948. Another record is expected this year, and completion schedules for some of the larger pipe-line projects indicate a big gain for 1951 with smaller increases in the two following years.

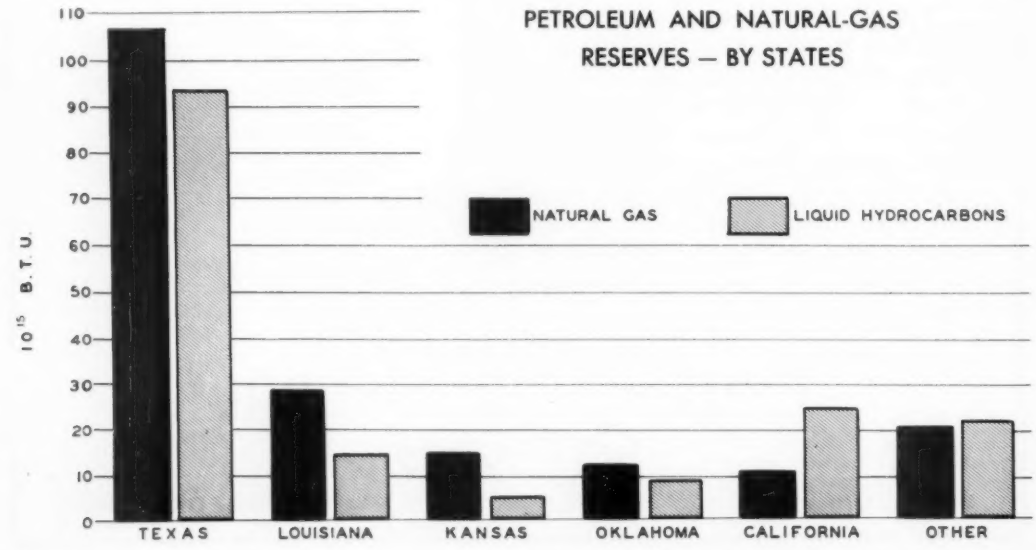
Causes of Industry's Growth

The tremendous growth in demand for natural gas has been due primarily to the fact that it is a quality fuel that can be delivered to areas with high energy requirements at prices that are competitive with other fuels. However, these competitive delivered prices are based on very low well-head prices for a given quantity of energy. Some of the postwar contracts were made at 10 cents per thousand cubic feet. This is at least twice as high as some of the prewar rates and yet at this rate, based on energy content, crude oil would bring less than 60 cents a barrel. Since gas-transportation costs are so much greater than the costs of moving liquid fuels either by pipe line or tanker, gas energy values at the well will always be less than crude.

An estimate of the differences in the ratios of well-head prices and transportation costs for liquids and gas can be found in a comparison of deliveries to the New York area. Delivery costs on Gulf Coast crude from the well to New York area will be only about 10 to 20 per cent of the original cost of the crude, depending on the source and type of crude. On the other hand, transportation costs for natural gas from the gulf area to New York will be more than two times the well price for gas even through the new large-diameter lines and purchased at postwar contract prices.

New York barge price for No. 2 fuel is about 1¼ times the cost of Gulf Coast crude, and while this ratio will not be maintained at all times, the delivered price will tend to reflect changes in posted crude prices.

Since a large part of the delivered price for natural gas results from transportation costs, including a high percentage of fixed costs, wholesale gas prices at delivery points must remain fairly constant. Delivered prices are made even more unchangeable by the fact that the long-term supply contracts are at fixed prices or with escalator clauses that call for field-price increases that are small in comparison with delivered prices. Thus, delivered prices at the end of a 10-year period will differ very little from the current level. This means

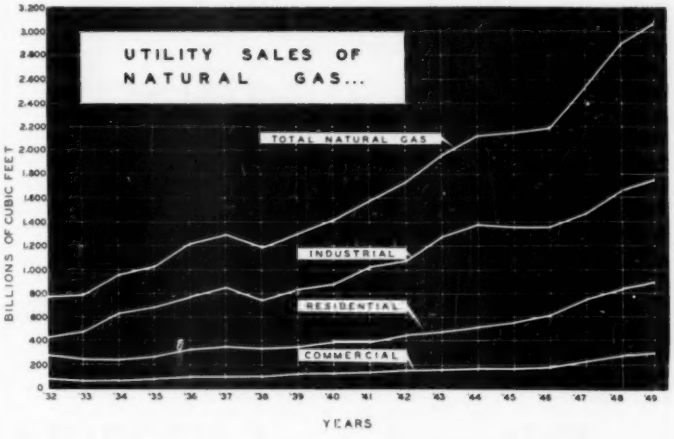


that further inflation would give natural gas an additional price advantage over liquid fuels or coal. Conversely, in a period of depressed economic conditions the natural-gas industry would find it more difficult to compete with these other energy sources, particularly in the industrial market where shifts are made from one fuel to another for small savings in energy costs.

Another reason for the postwar expansion of natural-gas demand has been the growing realization that the large reserves of this fuel insure a constant supply of energy for many years. On an energy basis our gas reserves exceed proven liquid-hydrocarbon reserves.

Using the conversion factor of 1,075 B.t.u. per cubic foot, our gas reserves at the end of 1949, as estimated by the reserves committee of the American Gas Association, amounted to about 194 × 10^{15} B.t.u. Total liquid-hydrocarbon reserves at the end of 1949 were estimated to be 28,378,501,000 bbl. by the American Petroleum Institute. If each barrel is valued at 6,000,000 B.t.u., the total would be about 170 × 10^{15} B.t.u. Thus, about 53 per cent of our total hydrocarbon reserve is in the form of natural gas.

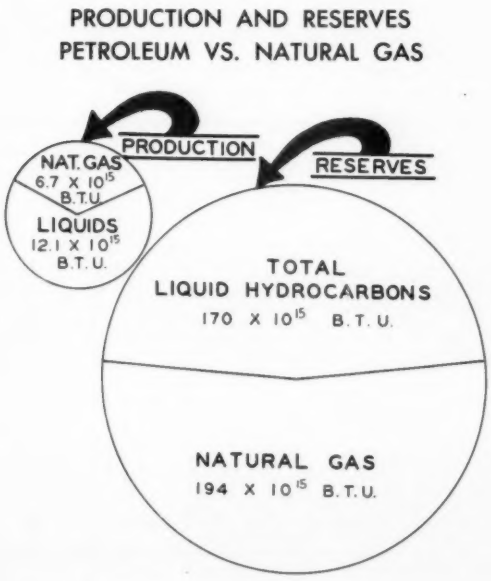
In contrast, energy produced in the form of liquid hydrocarbons is almost twice the production of natural gas or a ratio of 12.1 to 6.7. If the reserve-production relationships are expressed as ratios, natural-gas reserves are about 29 times the 1949 production compared with a ratio of 14 for total liquid hydrocarbons. In other words, if gas production had been twice as great as it was in 1949, the ratio of reserves to production still would have been as large as that for liquids.

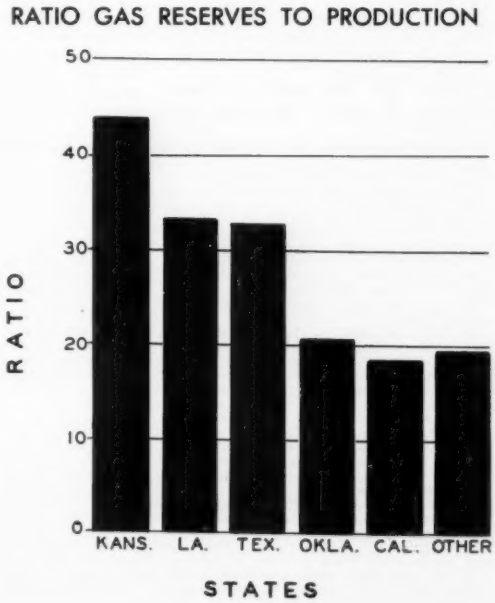


Since high energy consumption is the basis for the continued industrial and economic development of this country, the large reserves of natural gas must supply more and more of that energy.

All of the top hydrocarbon-producing states have more gas than liquid reserves with the exception of California. Comparisons for a few of the states are shown on an accompanying chart.

Texas, with 55 per cent of our total hydrocarbon reserves, has 13 per cent more gas reserves than liquid reserves. Gas exceeds liquids by 9 per cent in Louisiana and by 33 per cent in Oklahoma. In Kansas, Hugoton field helps boost the reserves of that state to more than twice the reserves of liquids. California, the second place state in crude production, ranks fifth in natural-gas reserves, but existing and proposed lines into the area will increase gas availability by more than 50 per cent.





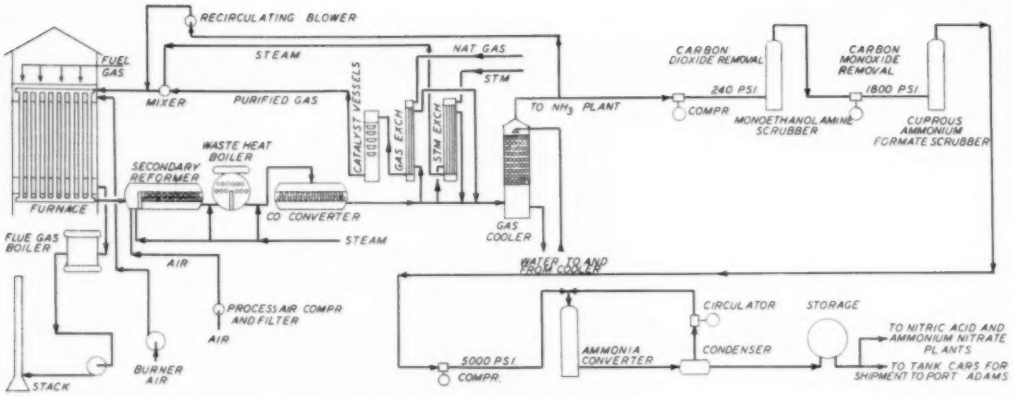


Fig. 1—Ammonia synthesis process flow diagram.

Utilization of NATURAL GAS for Conversion Into Nitrogenous Fertilizers

by W. R. Pierce* and C. W. Perry*

THE first commercial plant to produce ammonia by the reaction of nitrogen and hydrogen, although preceded by several years of research work, was started in Germany in 1913. The original German method is known as the Haber-Bosch process after Dr. Haber who conducted the experimental work with ammonia-synthesis catalysts and Dr. Bosch who engineered the process.

Today there are several modifications and improvements of this original process. Currently, more nitrogen† is fixed by the synthetic ammonia process than by all other processes combined.

Natural gas was first utilized as a source of hydrogen in an American plant in 1931. In 1950, approximately 43.5 per cent of the synthetic ammonia manufactured in the United States will employ the reforming of natural gas. The remainder will be manufactured from hydrogen obtained by reacting steam with coke and from hydrogen obtained as a byproduct in caustic-chlorine operations.

*Phillips Chemical Co., Bartlesville, Okla.

Background-Importance of Nitrogen

One of the country's major producers of nitrogenous fertilizer materials is the Cactus plant of Phillips Chemical Co., a wholly owned subsidiary of Phillips Petroleum Co. Formerly the Cactus Ordnance Works, located at Etter, Tex., the plant was leased by Phillips in August 1948.

†The fixation of atmospheric nitrogen, or the combining of pure nitrogen to form compounds which plants can use, is today one of the major industries in the United States. The use of synthetic-type fertilizers has grown steadily since 1903, when the fixation of atmospheric nitrogen first became of commercial importance. Since that time nitrogen-fixation processes have made enormous strides.

In 1900, the supply of fertilizer nitrogen was obtained from natural and byproduct sources. Natural organics supplied about 90 per cent, Chilean nitrate 9 per cent, and byproduct ammonium sulfate (from coke ovens) 1 per cent of the nitrogen for fertilizer. A gradual decline in the use of organics followed until in 1944, only 5.2 per cent of the nitrogen came from organics. But the total amount of nitrogen consumed during this period increased from 72,000 tons to 635,000 tons.

Nitrogen is one of the three principal plant foods, the other two being phosphorus and potassium. Although in smaller quantities, calcium, magnesium, and sulfur are also required for plant growth. Depending upon soil and plant deficiencies, other elements known to be required in trace quantities are boron, manganese, copper, zinc, iron, molybdenum, fluorine, chlorine, silicon, cobalt, and sodium.

Before these elements can be used as a plant food, they must be combined in a form that is available to plants. Nitrogen is a gaseous element that makes up 78 per cent by volume of the earth's atmosphere. It is estimated that for every acre of land, there are 148,000 tons of nitrogen in the air above the earth. Other than legumes, neither plants nor animals can use the gaseous form of nitrogen for the formation of growth cells; hence, the nitrogen must be added to the soil by other methods.

The usual practice is to blend materials containing nitrogen, phosphorus, potassium and the minor elements as required to produce a mixed fertilizer. The average plant food content of mixed fertilizers has grown from 13.9 per cent in 1900 to 21.7 per cent in 1945.

State laws require that the percentage of nitrogen, phosphorus, and potassium be printed on each bag of fertilizer. A bag of fertilizer marked 4-12-4 means that it is guaranteed to contain 4 per cent nitrogen, 12 per cent available phosphorus expressed as P_2O_5 and 4 per cent potassium expressed as K_2O. Nitrogen is always listed first followed by phosphorus and potassium.

A typical formula for 4-12-4 fertilizer is:

Material—	Plant food content (%)	Pounds of material
Ammonium nitrate	33.5	239
Superphosphate	20.0	1,200
Muriate of potash	60.0	133
Neutralization and filler		428
Total		2,000

Some of the important commercial nitrogenous materials with their nitrogen contents are:

Material—	Per cent nitrogen
Ammonium sulfate	21.0
Chilean nitrate (sodium nitrate)	16.0
Potassium nitrate	14.0
Calcium cyanamid	23.0
Urea	46.0
Ammonium nitrate	33.5
Anhydrous liquid ammonia	82.2
Nitrogen solutions	37.0 to 45.5

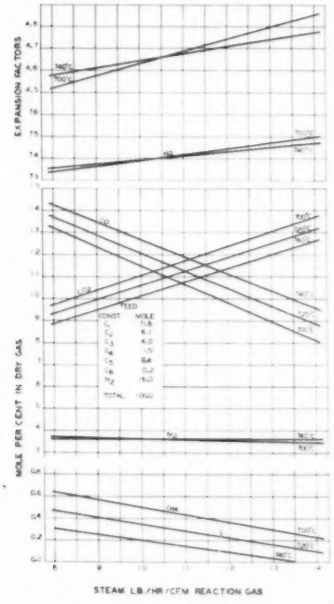


Fig. 2—Primary reformer equilibrium analyses, dry-gas basis.

SYNTHETIC AMMONIA PLANTS

Company and location—	Estimated capacity (approximately) tons, ammonia/year
Hydrogen from natural gas:	
Phillips Chemical Co., Etter, Tex.	160,000
Shell Chemical Co., Shell Point, Calif.	100,000
Hercules Powder Co., Pinole, Calif.	15,800
Mathieson Chemical Corp., Lake Charles, La.	69,000
Spencer Chemical Co., Pittsburg, Kans.	160,000
Lion Oil Co., El Dorado, Ark.	200,000
Commercial Solvents Corp., Sterlington, La.	69,000
San Jacinto Ordnance Works, Houston	24,000
Total (43.5 per cent)	797,800
Hydrogen from coke:	
Allied Chemical & Dye Corp., Hopewell, Va.	255,000
Allied Chemical & Dye Corp., South Point, Ohio	170,000
E. I. du Pont de Nemours & Co., Belle, W. Va.	205,000
Tennessee Valley Authority, Muscle Shoals, Ala.	67,000
Morgantown Ordnance Works, Morgantown, W. Va.	230,000
Ohio River Ordnance Works, Henderson, Ky.	60,000
Total (53.9 per cent)	987,000
Hydrogen or by-product:	
E. I. du Pont de Nemours & Co., Niagara Falls, N. Y.	13,400
Dow Chemical Co., Pittsburg, Calif.	3,500
Dow Chemical Co., Midland, Mich.	14,000
Mathieson Chemical Corp., Niagara Falls N. Y.	6,000
Pennsylvania Salt Manufacturing Co., Wyandotte, Mich.	11,000
Total (2.6 per cent)	48,000
Total all plants	1,832,800

The process in use at Cactus is a modification of the original Haber-Bosch process and utilizes natural gas for the source of hydrogen. Flow arrangement of the process is shown in the diagram, Fig. 1.

The natural gas at Cactus has the following approximate composition:

Constituent—	Per cent
Methane	71.8
Ethane	6.1
Propane	4.0
Butane	1.5
Pentane	0.4
Hexane	0.2
Nitrogen	16.0
Total	100.0

The raw gas contains from 5 to 30 grains of H_2S per 100 cu. ft. and from 0.02 to 0.40 grains of mercaptan sulfur per 100 cu. ft. A Girbotol monoethanolamine unit removes substantially all of the hydrogen sulfide; however, when operating at full capacity, practically none of the mercaptan sulfur is removed.

Since the nickel catalyst used in the reforming operation is poisoned by sulfur compounds, it is essential that the sulfur content of the gas be maintained at a low level. To remove the residual hydrogen sulfide and the mercaptan sulfur, the gas is heat exchanged with the effluent from the reforming unit and passed over zinc oxide at 750° F. An approximate analysis of this zinc oxide which is in the form of spheres about 1/16 to ¼ in. in diameter is as follows:

	Per cent
ZnO	91.1
AL_2O_3	7.0
Impurities	1.9
Total	100.0

The quantity of sulfur removed the-

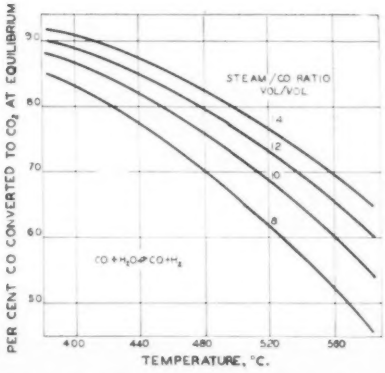


Fig. 3—Temperature and steam rate vs. CO conversion at equilibrium.

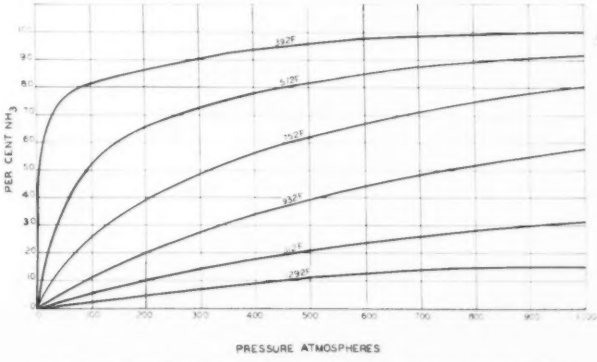


Fig. 4—Equilibrium percentage NH_3 in a 3:1 hydrogen-nitrogen gas mixture.

oretically could probably approach the stoichiometric value; however, in actual practice the utilization efficiency is only 4 to 5 per cent.

About 50 to 75 per cent of the sulfur in H_2S is removed and about 50 per cent of the mercaptan sulfur is removed by reaction with the zinc oxide. The low efficiency is probably due to carbon deposition on the surface of the catalyst, thereby preventing further catalytic action. Gas from sample connections on the zinc oxide vessels passes through cadmium acetate bubblers to determine if the gas is satisfactory for use. A distinct yellow color in the solution indicates an excessive quantity of sulfur in the gas.

Gas from the sulfur-removal vessels is then mixed with steam which has also been preheated to 750° F. The steam-gas mixture passes through externally heated stainless-steel furnace tubes which contain a nickel catalyst in Raschig-ring form. The ratio of steam to gas is set by the operator and recorded by orifice-type flowmeters. As a check on the meters, the steam-gas ratio from the furnace tubes is determined periodically by the operator. The temperature at the bottom of the tube is used as the control point for the furnace operation. An infrared recording instrument analyzes the methane concentration of the gas from each cell of the reforming process every 2 hours. Knowing this value, the operator can determine whether or not to increase the reforming temperature.

Sulfur and carbon deposition gradually decrease the activity of the nickel catalyst. By means of the infrared analyzer, the activity decline of the individual cells can be determined. After the methane concentration has exceeded a predetermined value, the catalyst is steamed and reduced again with hydrogen to the metallic state.

According to Dodge (Chemical Engineering Thermodynamics, McGraw-Hill Book Co., 1944, p. 526), many reactions are theoretically possible in the steam-methane reforming operation. These are:

$$CH_4 + H_2O \rightarrow CO + 3H_2$$
$$CH_4 + 2H_2O \rightarrow CO_2 + 4H_2$$
$$CH_4 \rightarrow C + 2H_2$$
$$CO + H_2O \rightarrow CO_2 + H_2$$
$$CO_2 + C \rightarrow 2CO$$
$$CO_2 \rightarrow C + O_2$$
$$2CO \rightarrow 2C + O_2$$
$$H_2O \rightarrow H_2 + \tfrac{1}{2}O_2$$
$$H_2O + C \rightarrow H_2 + CO$$
$$2CH_4 \rightarrow C_2H_6 + H_2$$
$$C_2H_6 \rightarrow C_2H_4 + H_2$$

Solving by trial and error complicated reaction equilibrium equations, the gas from the process will theoretically have the composition shown in Fig. 2.

Part of the nitrogen for the synthesis of ammonia is present in the natural gas used at Cactus. The remaining part is obtained by adding air to the reformed gas, oxygen in the air combining with the hydrogen to form water vapor. After passing through a waste-heat boiler to lower the temperature, the carbon monoxide is converted to carbon dioxide with the aid of an iron catalyst, thus:

$$CO + H_2O \rightarrow CO_2 + H_2$$

The equilibrium conversion is shown in Fig. 3.

The reformed gas contains the hydrogen and nitrogen for the synthesis of ammonia, but carbon monoxide and carbon dioxide are also in the gas. These carbon oxides are poisons to the ammonia synthesis process. The reaction of nitrogen and hydrogen to form ammonia is favored by high pressures and low temperatures as shown in Fig. 4. However, the rate of reaction is also a determining factor on which temperature to use in the process. The remainder of the ammonia process consists in removing the catalyst-poisoning carbon oxides and in compressing the gas to a pressure of 5,000 psi.

First the gases from the reforming area are compressed to 240 psi. Carbon dioxide is removed at this pressure by scrubbing with monoethanolamine. Absorption efficiency is about 99 per cent with practically none of the other gases removed by this scrubbing operations. The gas from the scrubbers is compressed to 1,800 psi. and the carbon monoxide and remaining carbon dioxide removed by a solution of cuprous ammonium formate. The exact chemical reactions of this absorption are still a matter of conjecture; although, because of the high efficiency of the absorption, a chemical reaction between the carbon oxides and the solution undoubtedly occurs. The solution is regenerated by heating at atmospheric pressure to 165° F. A maximum of 0.002 per cent carbon oxides remains in the gas following the purification units.

The process gas now contains the hydrogen and nitrogen required for the synthesis of ammonia and also methane, argon (obtained from the air addition in the gas reform process), and other inerts. The purified gas is compressed to 5,000 psi. and reacted at 930° F. over an iron catalyst.

So far as is known, the inert gases act only as a diluent lowering the partial pressure of the nitrogen and hydrogen. The effect of inerts and hydrogen-nitrogen ratio is shown in Fig. 5. The ammonia produced per pass averages about 11 to 14 per cent, depending on the condition of the converter and catalyst. The unreacted gas is recycled for economical reasons, purging a regulated amount to control the inert concentration.

The ammonia produced at Cactus is either shipped to the company's plant at Port Adams, Tex., where reaction of the ammonia with sulfuric acid produces ammonium sulfate fertilizer, or is made into ammonium nitrate in the recently installed equipment adjacent to the ammonia plant at Etter. It is also shipped directly to other customers.

The manufacture of ammonium ni-

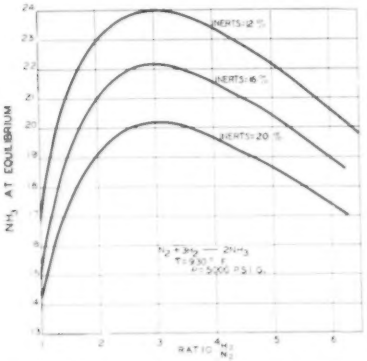


Fig. 5—Effect of ratio and inerts on the equilibrium conditions of the equation.

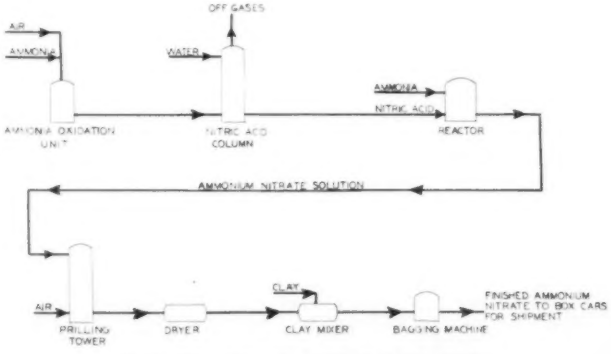


Fig. 6—Nitric acid and ammonium nitrate plants.

trate at Cactus plant consists of two chemical processes: the oxidation of ammonia with air to form nitrogen dioxide which is absorbed in water making nitric acid, and neutralization with ammonia of this nitric acid to form a solution of ammonium nitrate. A simplified flow sheet is shown in Fig. 6.

In the ammonia oxidation process, ammonia and air react in the presence of a platinum-rhodium catalyst at 1,650° F., the over-all reaction being:

$$4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$$

The nitric oxide is oxidized to nitrogen dioxide which is absorbed in water to form an acid of 55 to 60 wt. per cent concentration.

In the neutralization of nitric acid with ammonia, the reaction is simply:

$$NH_3 + HNO_3 \rightarrow NH_4NO_3$$

The solution from this reaction is concentrated and sprayed into a tower 150 ft. tall against a stream of air. Small spherical particles called prills are formed. These prills, which are about 1/16 to 3/32 in. in diameter, are dried in rotary dryers and coated with diatomaceous earth to prevent caking. The finished material is packed in 100-lb. paper bags for shipment.

Another popular form of nitrogen for use in blending fertilizers is nitrogen solutions. These are a mixture of ammonium nitrate, ammonia, and water. The fertilizer mixer blends these with superphosphate to obtain the desired ratio of nitrogen to phosphorous in a mixed fertilizer. It is estimated that 25 per cent of all fertilizer nitrogen is now derived from nitrogen solutions.

The Port Adams plant neutralizes sulfuric acid with ammonia according to the equation:

$$2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$$

This material is also dried and may be shipped either in bulk or in bags.

BOOKS

AN INDEX OF NOMOGRAMS. Compiled and edited by Douglas Payne Adams. Published jointly by the Technology Press of Massachusetts Institute of Technology, and John Wiley & Sons, Inc., 440 Fourth Avenue, New York. 174 pp. $4.

This unusual index lists over 1,700 published nomograms in well-known periodicals, and this serves as a time saver in the repeated solution of mathematical formulas. It directs the reader to the nomogram he will need for the quick and accurate solution of his problem and saves him long hours of complicated processes in the construction of such a nomogram. The book is divided into two main parts, Index A—Key Works, and Index B—Master Index. In the first the reader will find an alphabetical list of key words which are associated with each of the diagrams. Following each entry is the key number permitting reference to Index B where the periodical, date of issue, and so on are listed.

Aerial Surveys Speed Mapping Work on Transco Project

by Lucien A. Ulmer*

A LIBRARY consisting of 500,000 sq. miles of aerial photographs and 268,260 sq. miles of ownership maps saved hundreds of valuable hours in preliminary mapping of the Transcontinental Gas Pipe Line System. It was on October 15, 1948, that Maj. N. R. McKay, chief engineer for Fish Constructors, Inc., acting as agent for Transcontinental Gas Pipe Line Corp., telephoned from Houston to Edgar Tobin Aerial Surveys in San Antonio to advise that his party would be in San Antonio the following day to discuss map routes for the proposed gas pipe line from the lower Rio Grande Valley to New York City.

At the conference, Tobin men produced from existing files aerial photographic mosaics in 15-minute quadrants covering the route outlined by McKay. The quadrants were assembled to form a continuous strip map from South Texas to a point on the Tombigbee River in Alabama, this being the present extent of Tobin mapping coverage affecting the proposed pipe-line route.

Fish representatives indicated the terminal points as well as certain interior points through which the proposed line was required to pass. Thumb tacks were inserted at these points on the aerial photographs and a line strung from each thumb tack to the next, indicating the most direct line between the two terminals for the 850-mile traverse. The aerial photographs with the taut string presented a bird's-eye view of the most direct right-of-way location.

Each mile of the direct route was minutely scrutinized on the aerial maps for physical obstacles as reflected by the photographs. In this manner towns, lakes, swamps, canals, orchards, populated communities, bad river crossings, and numerous other hazards prohibitive to efficient pipeline construction were bypassed. This was done by realigning the string sufficiently to one side only enough to miss the undesirable physical feature and inserting a thumb tack to hold the string in the most favorable position.

At one point in Louisiana the most direct line went through the middle of a very large swamp. An alternate route at this point was imperative. The alternate route was selected by examining the existing photographs for all possible deviations, bearing in mind proximity to highways and roads for the hauling of heavy equipment. By actual measurement on the photograph one full mile was saved.

The location of the line having been selected from the aerial photographs, the proposed line was drawn on ownership maps from the Tobin files. As the ownership maps are compiled on the same aerial photographic base, it was a comparatively simple matter to transfer the line route from the aerial photographs and obtain the identical line on the ownership map. The ownership maps were then minutely examined in the same manner as the photographs. In some instances, where the line crossed congested areas and small subdivided tracts, it was thought advisable to move the line to avoid this situation where possible.

Upon completion of the operation, McKay and his staff of engineers not only had located the most desirable route for the proposed Transcontinental Gas Pipe Line, but knew the individual tracts of land that would be traversed by the line. At this point even the approximate footage of right-of-way to be purchased could have been determined, subject to such change as the ground survey would indicate from ground obstructions unknown at the time.

The operations, as outlined, were accomplished in less than 2 days' time.

Edgar Tobin Aerial Surveys on November 4, 1948, proceeded with the maps covering the line as outlined by McKay. The material to be furnished was a controlled aerial photographic mosaic 3 miles in width, including 1½ miles each side of the proposed line as selected. The photographs were furnished in 10-ft. lengths or roughly 20-linear-mile strips, with the ownership strip map of exactly the same size conforming to the same area and at the same scale of 1,000 ft. equal to 1 in. The ownership map was furnished in the form of a film positive transparency to overlay the aerial photographs, and one blueprint and a van dyke negative from which as many blueprints could be made as would be needed.

Delivery was begun on the Transcontinental right-of-way maps as outlined, starting November 10, 1948, with two strip maps (approximately 40 miles). Delivery was then continuous until completion of the approximately 850 linear miles on January 7, 1949.

*Director, Map Compilations, Edgar Tobin Aerial Surveys.

ROAD VS. LABORATORY KNOCK RATINGS

by J. B. Duckworth, G. T. Moore, and C. J. Domke

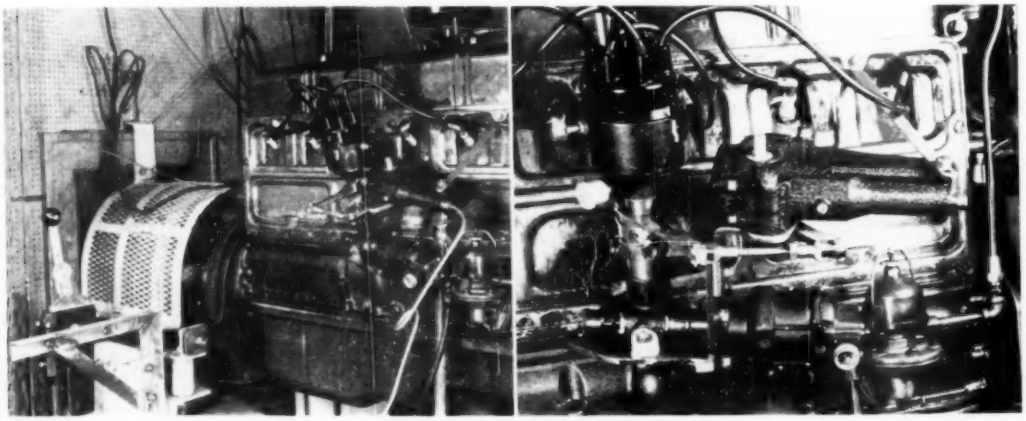
KNOCKING behavior is one of the few properties by which the customer may readily assess gasoline quality. The two characteristics the user recognizes most easily are antiknock properties and volatility. Starting, warmup, and vapor lock are all affected by volatility.

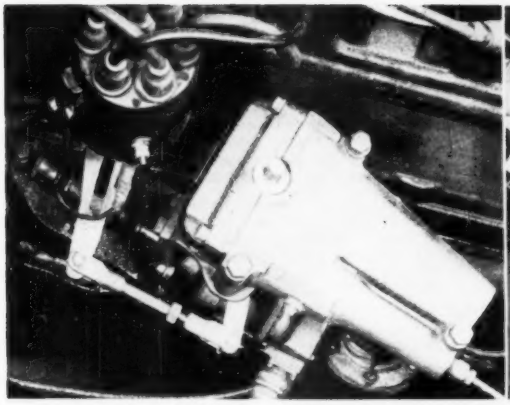
Light ping or knock is recognized by the automotive and oil industries as their common problem, and attempts to eliminate this source of annoyance have been the subject of intensive investigations for a good many years. Out of these studies have been developed two laboratory knock-test methods. Until recently, the motor method was widely used for refinery control of antiknock quality, and the research method was used as a secondary control.

History of the Motor and Research Methods

The first knock-test method was established in 1928 by the Coordinating Fuel Research Committee, and was practically identical with the present research method. The research method, in fact, was developed to duplicate this first method while eliminating certain of its minor drawbacks. In 1931, however, Ethyl Corp. reported the results of extensive road knock tests which indicated that cars did not rate fuels in the same relative order as did the C.F.R. method. Because of certain service difficulties, Ethyl Corp. elected to judge road knocking on the basis of engine speed at which knocking disappeared. This resulted in comparison

Fig. 1—(Left) Spark control and tachometer generator mounted on test engine. Fig. 2—(Right) Closeup of spark control and tachometer generator.





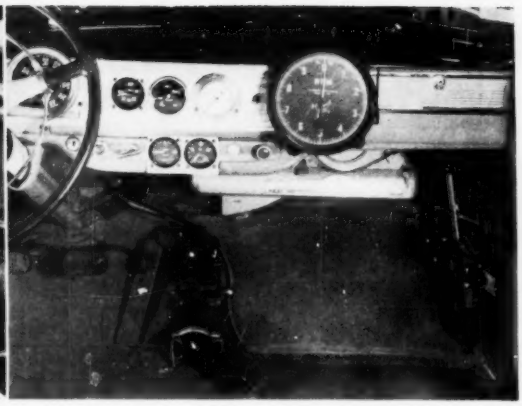


Fig. 3—(Left) Spark control and tachometer generator as installed in test vehicle. Fig. 4—(Right) Instrument panel of test car, spark-timing indicator (left) and spark control (right).

of fuels under what have subsequently been termed high-speed knocking conditions.

On the basis of these results, the C.F.R. investigated the problem and conducted an extensive road knock study at Uniontown, Pa., during the summer of 1932.[1] The results of this study—in which knocking was judged under high-speed conditions—led to revision of the laboratory knock-test procedure. A more severe test, the motor method, was evolved. This laboratory method rated the fuels in substantially the same order as did the cars. In 1934[2] the road-test program was repeated and the validity of the motor method in reflecting high-speed knock was verified. The motor method was standardized by the A.S.T.M. in 1939, has undergone minor revisions since that time, and now bears the designation D357-48.

In 1939 a modification of the original C.F.R. method was standardized by the C.F.R.; this is now commonly referred to as the research method. The A.S.T.M. has accepted the research method as a tentative standard; it is designated D908-48T.

The motoring public has developed an increasing preference for fuels having relatively high research ratings—as much as 10 units above the motor values. The motorist prefers such fuels because they suppress the rather conspicuous knocking that occurs at low speeds during full-throttle acceleration.

The laboratory method selected for antiknock quality control should evaluate motor fuels in the order of customer preference. Any laboratory method is highly arbitrary and produces data applicable to a selected set of conditions; it cannot determine actual performance in service. Performance must be determined in service equipment under actual driving conditions. It has long been appreciated that the research method more nearly reflects low-speed knocking performance in most automobiles than does the motor method. Considerable data have been acquired on this point by our laboratories and test fleet. This paper will review the data and show how customer preference may be expressed in terms of laboratory knock ratings.

Road-Test Equipment

In establishing a relation between laboratory and road knock ratings, a considerable mass of data must be obtained to provide adequate coverage of the fuel types normally encountered. These data may be obtained by (1) testing a number of fuels in several cars, representing a reasonable cross-section of cars on the road, or (2) studying a larger number of fuels—representing a more complete coverage as to fuel composition, octane number, and tetraethyl lead content—in one particular car judged to be representative of a large portion of the cars on the road. In this study the latter basis was chosen. Producers of motor fuels are interested in studying fuels rather than engines. Previous studies had indicated that a properly chosen test car would yield data substantially equivalent to those obtainable with a variety of cars. Adequate instrumentation and strict attention to mechanical maintenance have assisted in maintaining the representative nature of the test vehicle.

Since the test work required road knock ratings from 68 to 88 motor octane number, it was necessary to provide an arrangement whereby knocking could be induced with any

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J. B. Duckworth joined Standard Oil Co. (Ind.) research department in 1936 after graduation from Purdue University with a B. S. degree in mechanical engineering. After 4 years of military service with the Air Force, he returned to Standard's research department as section leader and is now assistant director of research in charge of mechanical research. Duckworth is a member of the Society of Automotive Engineers.

G. T. Moore is group leader in charge of motor-fuel engine testing at Indiana Standard. He received a B. S. degree in engineering from University of Illinois in 1932 and immediately joined Standard. Moore spent considerable time in laboratory and road testing until the war, when he was placed in charge of engine-laboratory equipment, operation, and maintenance. He assumed his present position in 1945.

C. J. Domke joined the Indiana Standard research department in 1941. He was graduated from Loyola University with a B. S. degree in chemistry and was associated with Burgess Battery Co. before coming to Standard. Domke was engaged in pilot-plant work prior to his present assignment as an assistant project engineer working on various phases of motor-fuel testing and development. He is a member of the American Chemical Society.

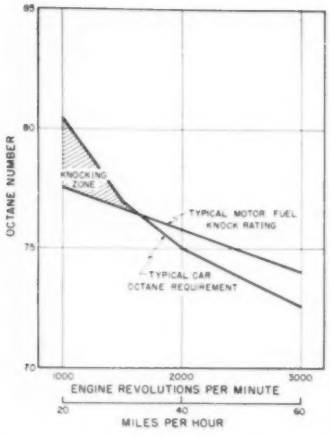


Fig. 5—Typical car octane requirement and motor-fuel road knock rating.

fuel in this range at the will of the test operator. This necessitated a wide range in spark setting, together with instruments to permit quantitative measurement of spark advance or retard. A hydraulic control device was installed to actuate the spark distributor and provide rapid but rigid control of spark settings. In addition to the hydraulic spark control a tachometer generator was installed on the distributor drive shaft. This latter equipment enabled the operator to determine engine revolutions per minute at any instant during a test run. These two devices are shown installed on a dynamometer test stand in Figs. 1 and 2. Fig. 3 shows an actual test-car installation. Fig. 4 shows the instrument panel and auxiliary controls that provide the operator with crankcase-oil and jacket-water temperatures, oil pressure, fuel-pump pressure, manifold pressure, control for spark setting, and a stroboscope for determination of spark advance or retard in terms of crank-angle degrees. Not shown in these photographs is the fuel valve that permits proper selection of the test or reference fuel.

Road-Test Technique

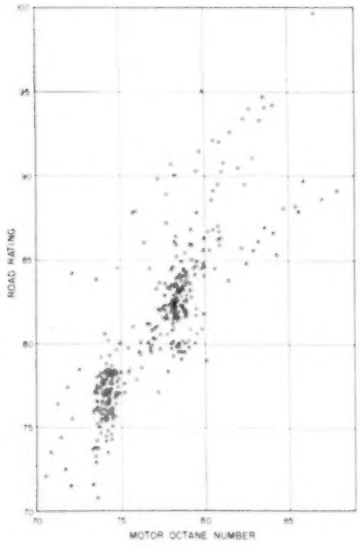
Concurrently with the adoption of laboratory knock-test methods, there have been developed a number of road knock-test methods. The Uniontown method[1,2], with or without minor modifications, is probably the most widely accepted means for evaluation of knocking tendencies in motor fuels. It requires auditory comparison of knocking characteristics of the test fuel with bracketing reference fuels at the point of knock during full-throttle acceleration, regardless of engine or car speed. The fact that a test fuel knocks somewhere between 10 and 60 m.p.h. during test does not imply that the fuel is of inferior quality, since knocking is induced by arbitrarily advancing the spark timing without regard to vehicle octane requirement.

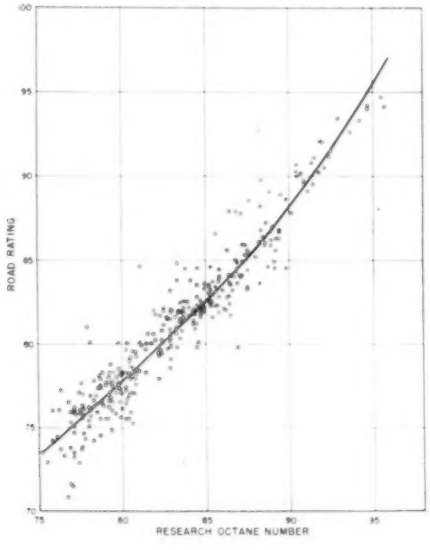
More recently, a technique commonly referred to as the "Borderline Knock-Test Method"[3] has been developed, and has been used by many investigators. This method accomplishes substantially the same result as the Uniontown method, except that knock ratings are obtained over the entire speed range. Thus, in effect, a single road knock rating is obtained by the Uniontown method, but a whole series of knock ratings is obtained on a single fuel by the Borderline method. The Borderline method also makes available additional information regarding fuel and engine behavior, and is particularly useful in studying new engine designs or new fuels.

The situation with respect to current production of automobiles and motor fuels, however, is somewhat different and does not generally require the exploratory type of testing exemplified by the Borderline method. This situation is illustrated in Fig. 5, which shows vehicle octane requirement and motor-fuel road knock ratings for a typical car and a typical housebrand gasoline. These curves indicate that knocking, if it is present, will usually occur at low car speeds, and further, that the fuel in question has sufficient anti-knock quality to suppress detonation at higher car speeds. This analysis, together with careful studies of knocking characteristics in a large number of vehicles and observation of public driving habits, indicates that customers will ordinarily evaluate gasoline-knocking qualities at low car speeds. The Uniontown method has therefore been modified, and now compares test and reference fuels at a car speed of 20 m.p.h.

In the current study, road knock ratings for all fuels were determined by the modified Uniontown procedure. In carrying it out, the car is accelerated at full throttle from 7 to 40 m.p.h., and the spark timing is adjusted until the test fuel produces the standard trace knock at 20 m.p.h.

Fig. 6—(Left) Road (20 m.p.h.) versus motor knock ratings. Fig. 7—(Right) Road (20 m.p.h.) versus research knock ratings.





The reference fuels used to bracket all test fuels were limited to primary standards: 2,2,4-trimethylpentane ("isooctane") and n-heptane, and blends of the two. The final value represents the mean of at least two determinations, of which one pair must agree within two units.

Test Fuels

Test fuels employed in this study included 300 commercial motor fuels picked up at service stations throughout the Midwest and Eastern areas, plus 73 fuels specially prepared to fill out gaps not covered by these commercial fuels. The fuels covered the range 68 to 88 motor octane number or 75 to 95 research oc-

(Cont. on page 149)

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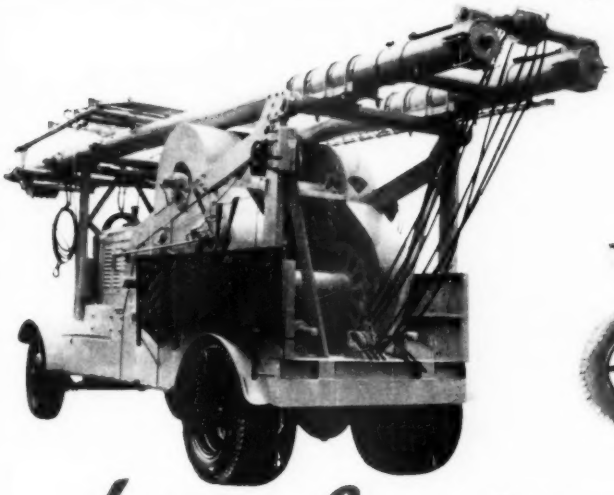

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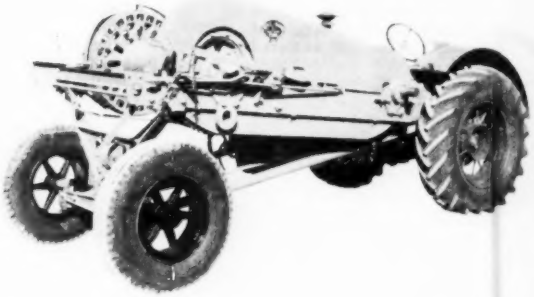

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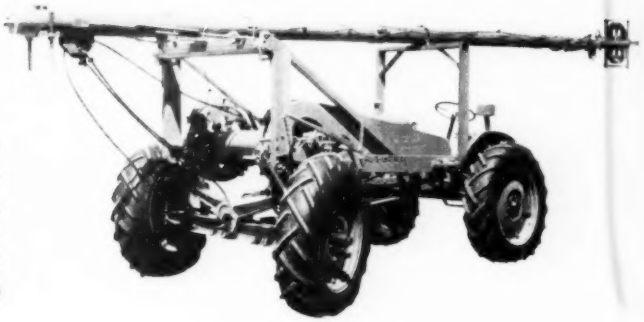

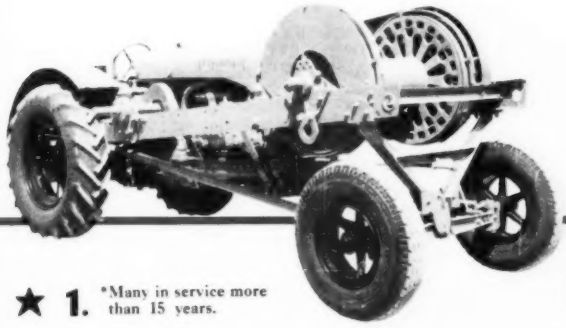

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Model M for wells to 4000′
Model E for wells to 5000′
Model L for wells to 10,000′, servicing 2½″ upset tubing.

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DRILLING IN WESTERN NEBRASKA

. . . Discovery and Development of Crude Oil and Gas Reserves in Cheyenne County

by William L. Herschman*

Ohio Oil Co. on May 14, 1949, at its 1 Mary Egging, 11-15n-49w, Cheyenne County, Nebraska, cored saturated sand at a depth of 4,406-09 ft. This show of oil has led to the development of Gurley field and more recently to Huntsman field and proved that given favorable structural conditions, oil has been accumulated in commercial quantities on the eastern side of the Julesburg basin.

This article gives some of the exploration history prior to discovery and brings the field development up to date. Paper presented at spring meeting, A.P.I., Rocky Mountain Production District, Casper, Wyo.

CHEYENNE County, Nebraska, is the center of three counties in the panhandle of Nebraska that border on Colorado. The county is crossed from east to west by the main line of the Union Pacific Railroad and U. S. Highway 30 and from north to south by the Chicago, Burlington & Quincy Railroad and State Highway 19.

Most of Cheyenne County is flat and quite level. It is ideal land for raising winter wheat and this is the staple crop of the area. One major drainage, the Lodgepole Valley, has been eroded into the otherwise level upland plain to a depth of 200 ft. and adjacent to this major drainageway some of the topography is very rough and broken. Lodgepole Creek flows from east to west across the county.

Geology of Area

Cheyenne County lies in the Julesburg basin about 80 miles southwest from the Chadron arch, and about 1,500 to 1,900 ft. down dip from the crest of the arch in the vicinity of Hyannis, Grant County, Nebraska. The regional dip in the basin continues to the west and southwest for about another 100 miles or until it gets very close to the Rocky Mountain front on the vicinity of Cheyenne and Denver.

Surface formations in Cheyenne County are of Tertiary age. This blanket of Tertiary is approximately 1,000 ft. thick at a maximum. The structural attitude of the underlying Cretaceous and older formations is completely masked by the Tertiary. In fact, the Tertiary dips generally to the east, while the older beds dip to the west.

Directly underlying the Tertiary is the Pierre shale, of Cretaceous age. Approximately 2,700 ft. of Pierre is present in the county. In descending order the remainder of the Cretaceous is as follows:

	Ft.
Niobrara limy shale	250
Ft. Hays limestone	100
Codell sand	11
Upper Benton shale	172
Greenhorn limestone	25
Lower Benton shale	220

So-called Dakota sands and shale, which include the pay section at Gurley and Huntsman—200 ft.

	Ft.
So-called Fuson shale	153
So-called Lakota sands and shale	220

The 1 Knievel well in Gurley field, was bottomed after drilling 64 ft. of light green shale believed to be Morrison.

So much of the section as has been described above is known from actual drilling in the area.

Remainder of the section can be inferred from deep wells. Closest well to the area which drilled the pre-Cretaceous section is Sinclair's Delatour in 33-19n-45w, Garden County, Nebraska, or about 50 miles to the northeast. Sinclair drilled this well in 1944 with rotary tools to a depth of 5,445 ft or 5 ft. into the pre-Cambrian complex. Electric log of this well is available. Scout tops of the log show Sinclair drilled 249 ft. of Morrison, 738 ft. of shale anhydrite and dolomite believed to be Permian, 470 ft. of Pennsylvanian shales and limestone, and 45 ft. of basal sands of Pennsylvanian to pre-Cambrian age. From this log it may be seen that a large portion of the Paleozoic section is missing.

Oil Possibilities for Julesburg Basin

For many years the Julesburg basin has been considered an excellent structural province in which to explore for oil. The thick Cretaceous shale section was known to be petroliferous, and potential reservoir rocks were known to be present in the form of the Muddy, Dakota, and Lakota sands. The occurrence of oil in the Muddy sands of the Greasewood field, in 6-6n-61w, Weld County, Colorado, intensified interest in the area. The question was to find what circumstances were necessary to cause the accumulation of oil, and then to determine the locations where those conditions existed.

Ohio Oil Co. initiated a seismic program in 1943 and carried it on into 1944. During this portion of the program, work was started in the vicinity of Greely, Colo., and carried eastward to the vicinity of Sterling and Akron, Colo. Following this initial phase of geophysical work the Ohio drilled its Nordloh well in 20-5n-63w, Weld County, Colorado, and Tide Water Associated Oil Co. drilled two farmout wells in 30-5n-60w, Morgan County, Colorado, and in 1-3n-61w, Weld County, Colorado. These wells were drilled through the Dakota sands on features of small structural closure, and all were dry.

The second phase of exploration was started in 1946 and carried eastward from Sterling to the vicinity of Imperial, Neb., and northward to Bridgeport and Oshkosh, Neb. Structural conditions favorable for the accumulation of oil were encountered in Cheyenne County, Nebraska, and after leases were taken the Egging location was selected for drilling, with the results mentioned above.

Gurley Oil Field

Development.—Gurley field is located on a structural feature which has in excess of 100 ft. of independent closure. To date 10 wells have been drilled in the field and 1 well is drilling. Of the 10 wells completed 7 are oil wells and 3 are dry holes. Of the three dry holes, one is a failure because of the inability to shut off water in the bottom of the hole. The other two are suspended pending deeper drilling. Of the seven producing wells, six are producing from the first bench of the so-called Dakota and one well produces from the third bench. The producing wells all require pumping to lift the oil to the surface and average over 100 bbl. of oil per day per well.

Producing section.—At Gurley production is from three major sand bodies. The first bench of sand con-

(Continued on page 148)

*Ohio Oil Co., Casper, Wyo.

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Intermediate Base Crude Oils*

(See also Questions on Technology March 9 and March 23, 1950)

Field and State—	A.P.I.	Sulfur per cent	Characterization factor†
Arkansas			
Magnolia	40.9	0.90	11.86 & 11.84
Midway	36.6	1.36	11.86 & 11.80
Schuler	33.2	1.54	11.84 & 11.80
Stephens-Smart	30.2	1.99	11.87 & 11.83
Village	41.1	0.80	11.91 & 11.92
California			
Belridge, N.	42.6	<0.10	11.75 & 11.88
Coalinga, Nose	31.1	0.31	11.56 & 11.66
Coles Levee, N.	35.0	0.50	11.65 & 11.52
Coyote East	25.4	1.44	11.50 & 11.48
Coyote West	27.7	1.21	11.60 & 11.58
Del Valle	33.2	1.14	11.66 & 11.65
Dominguez	33.0	0.93	11.66 & 11.70
Elwood-Goleta	38.0	0.18	11.75 & 11.80
Greeley	37.6	0.29	11.80 & 11.65
Helm	60.8	<0.10	11.80 & 11.76
Helm	33.8	0.21	11.66 & 11.68
Huntington Beach	24.7	1.26	11.54 & 11.49
Jacalitos	38.6	0.34	11.70 & 11.69
Kettleman North Dome	34.0	0.50	11.71 & 11.74
Long Beach	22.3	1.34	11.62 & 11.49
Montebello (W. area)	35.2	0.28	11.64 & 11.70
Mountainview	30.0	0.44	11.62 & 11.64
Newhall-Potrero	32.7	0.52	11.70 & 11.68
Paloma	53.5	0.10	11.76 & 11.83
Pleasant Valley	29.9	0.35	11.62 & 11.69
Raisin City	25.7	0.41	11.60 & 11.60
Rincon	29.9	1.11	11.70 & 11.68
Rio Bravo	38.2	0.22	11.72 & 11.78
Riverdale	40.0	0.22	11.73 & 11.76
Rosecrans-Athena	37.8	0.53	11.82 & 11.74
San Miguelito	31.7	0.93	11.68 & 11.62
Santa Fe Springs	34.2	0.26	11.66 & 11.78
Seal Beach	24.2	1.23	11.70 & 11.62
Ten Section	37.8	0.37	11.65 & 11.63
Torrance-Hermosa	22.8	1.62	11.52 & 11.54
Ventura Avenue	30.2	1.17	11.70 & 11.66
Colorado			
Rangely	35.2	0.73	11.78 & 11.92
Wilson Creek	49.5	0.11	11.92 & 12.16
Illinois			
Bible Grove	40.0	0.17	11.78 & 11.80
Boyd	39.4	0.14	11.87 & 11.98
Centralia	37.2	0.15	11.94 & 11.98
Clay City	38.8	0.15	11.89 & 12.00
Dale-Hoodville	40.0		11.84 &
Jacksonville	37.2	0.18	11.80 & 11.88
Louden	38.8	0.26	11.86 & 11.88
Mt. Carmel	35.4	0.20	11.82 & 11.88
New Harmony	38.4	0.24	11.88 & 11.86
Patoka	38.6	0.16	11.88 & 11.98
Salem	37.4	0.21	11.82 & 11.85
Indiana			
Griffin	36.0	0.19	11.88 & 11.98
Kansas			
Bemis-Shutts	35.8	0.50	11.86 & 11.92
Bloomer	43.4	0.30	11.96 & 11.97
Bornholdt	34.8	0.62	11.92 & 11.94
Burnett	38.0	0.45	11.92 & 11.96
Burrton	32.5	0.56	11.92 & 11.96
El Dorado	34.4	0.27	11.88 & 11.76
Genesco	38.6	0.54	11.96 & 11.98
Gorham	37.0	0.47	11.90 & 12.00
Hall-Gurney	39.0	0.35	11.94 & 12.00
Kraft-Prusa	43.0	0.27	11.96 & 11.96
Morel	27.3	0.67	11.70 & 11.84
Ray	32.3	0.58	11.88 & 11.92
Silica	42.8	0.31	11.94 & 11.97
Stoltenberg	38.6	0.32	11.94 & 11.98
Trapp	39.2	0.41	11.94 & 11.98
Zenith-Peace Creek	42.1	0.32	11.92 & 11.92
Kentucky			
Poole	36.6	0.26	11.84 & 11.86
Smith Mills	32.7	0.39	11.64 & 11.82
Uniontown	37.8	0.26	11.86 & 11.87
Louisiana			
Anse la Butte	37.8	<0.10	11.68 & 11.92
Barataria	36.6	0.11	11.82 & 12.04
Bayou Sale	37.4	<0.10	11.83 & 12.01
Caillow Island	36.6	0.18	11.78 & 11.84
Charenton (light)	36.0	<0.10	11.84 & 12.14
Delta Farms	33.8	0.22	11.76 & 11.82
Garden Island Bay	37.8	0.15	11.84 & 12.00
Grand Bay	37.2	0.14	11.88 & 12.14
Hackberry, East	35.0	0.26	11.52 & 11.62
Holly Ridge	37.0	<0.10	11.86 & 12.13
Iowa	41.3	<0.10	11.82 & 11.92
Jennings	35.6	0.15	11.68 & 11.84
Lake Salvador	35.8	0.13	11.88 & 12.11
Lake St. John	30.0	0.13	11.62 & 12.12
Lake Verret, West	36.8	<0.10	11.83 & 12.15
Neale	47.6	<0.10	11.80 & 12.10
Olla	30.8	0.13	11.72 & 12.07
Paradis	38.0	0.12	11.92 & 12.11
Pine Prairie	41.1	<0.10	11.72 & 12.07
Port Barre	32.8	0.29	11.54 & 11.72
Quarantine Bay	35.8	0.12	11.84 & 12.02
St. Gabriel	34.8	0.17	11.74 & 11.76
West Bay	33.0	0.26	11.78 & 11.91
West Cote Blanche Bay	31.0	0.15	11.62 & 11.86
White Lake, East	36.2	<0.10	11.61 & 12.06
Mississippi			
Brookhaven	26.6	0.86	11.75 & 11.85
Eucutta	23.1	3.89	11.88 & 11.58
Heidelberg	25.7	3.03	11.88 & 11.56
Montana			
Cut Bank	36.8	0.77	11.82 & 11.76
Kevin-Sunburst	31.9	1.47	11.53 & 11.60
New Mexico			
Arrowhead	34.2	1.30	11.57 & 11.62
Eunice	33.8	1.24	11.54 & 11.60
Grayburg-Jackson	37.2	0.95	11.74 & 11.78
Hobbs	34.6	1.45	11.60 & 11.62
Langlie-Mattix	34.8	1.35	11.75 & 11.59
Loco Hills	36.6	1.02	11.72 & 11.76
Maljamar	38.6	0.70	11.74 & 11.80
Monument, N.	32.1	1.39	11.50 & 11.50
Penrose-Skelly	36.2	1.04	11.79 & 11.78
Vacuum	37.4	0.87	11.75 & 11.80
Oklahoma			
Allen	29.9	0.24	11.72 & 12.07
Antioch, S.W.	42.3	0.14	11.88 & 12.14
Bowlegs	40.9	0.31	11.78 & 11.78
Burbank	35.8	0.21	11.90 & 12.01
Cement	31.0	0.21	11.83 & 12.16
Crescent	40.6	<0.10	11.94 & 12.11
Cumberland	34.8	0.46	11.92 & 11.92
Cushing	40.7	0.25	11.88 & 12.02
Edmond, W.	41.5	0.14	11.90 & 12.08
Glenn Pool	33.6	0.35	11.79 & 11.83
Healdton	33.6	0.77	11.88 & 11.90
Hewitt	35.0	0.84	11.91 & 11.87
Little River	39.6	0.25	11.84 & 11.82
Lone Grove, S.W.	36.4	0.79	11.86 & 11.91
Oklahoma City	37.8	0.11	11.94 & 12.11
Seminole City	38.6	0.27	11.88 & 11.91
St. Louis Dist. (Simpson)	37.4	0.36	11.84 & 11.88
Tatums	22.1	1.67	11.68 & 11.62
Tussy	25.6	1.54	11.68 & 11.64
Velma (Shallow)	28.2	0.81	11.76 & 11.92
Texas			
Anahuac	37.4	0.13	11.88 & 12.06
Aransas Pass	41.7	<0.10	11.78 & 11.70
Barbers Hill	33.8	0.15	11.54 & 11.82
Barnhart	46.3	<0.10	11.92 & 12.11
Benavides	43.8	<0.10	11.90 & 11.83
Cowden, N.	35.0	1.66	11.74 & 11.72
Cowden, S.	33.0	1.38	11.74 & 11.78
East Texas	37.8	0.36	11.79 & 11.92
Embar (Ellenburger)	44.9	0.18	11.92 & 12.12
Fairbanks	36.4	0.11	11.80 & 11.91
Foster	36.4	1.07	11.76 & 11.88
Fuhrman-Mascho	22.5	4.17	11.57 & 11.62
Fullerton	43.2	0.48	11.88 & 12.08
Goldsmith	34.2	1.90	11.84 & 11.92
Hawkins	25.7	2.45	11.88 & 11.49
Howard-Glasscock	24.0	2.76	11.52 & 11.47

(Continued on Next Page)

INTERMEDIATE BASE CRUDE OILS*

(See also Questions on Technology March 9 and March 23, 1950)

Field and State—	A.P.I.	Sulfur per cent	Characterization factor†
Howard-Glasscock	29.1	1.64	11.64 & 11.68
Hull	32.1	0.20	11.52 & 11.80
Hull-Silk-Sikes	40.9	0.48	11.78 & 11.94
Iatan-East Howard	32.1	1.40	11.56 & 11.62
Jordan	34.6	2.13	11.46 & 11.80
Kermit	28.4	1.45	11.60 & 11.59
Keystone	35.2	0.84	11.66 & 11.74
K. M. A.	42.6	0.17	11.84 & 11.90
K. M. A.	40.0	0.23	11.78 & 11.90
Lovell's Lake	38.0	<0.10	11.65 & 11.98
Luby	48.8	<0.10	11.78 & 11.59
Luling-Branyon	27.7	0.92	11.60 & 11.66
McCamey	25.6	2.23	11.58 & 11.46
McElroy	31.3	2.39	11.72 & 11.66
McFaddin (Frio sand)	48.1	0.11	11.92 & 11.82
Means	29.3	2.36	11.70 & 11.66
Old Ocean	36.2	0.11	11.70 & 11.88
Penwell	30.8	2.59	11.76 & 11.76
Quitman	44.1	0.87	11.94 & 11.94
Saxet (Deep Frio)	60.0	<0.10	11.84 &
Seeligson	40.9	<0.10	11.74 & 11.84
Seminole	35.6	1.76	11.70 & 11.70
Silsbee	42.0	<0.10	11.88 & 12.02
Slaughter	32.3	2.07	11.65 & 11.59
Stowell-Winnie	33.4	0.17	11.71 & 11.92
Stratton	42.1	<0.10	11.82 & 11.62
Sun	44.9	<0.10	11.88 & 11.78
Talco	22.8	2.98	11.92 & 11.76
Todd, Deep	40.0	0.15	11.86 & 12.10
Tomball	41.7	<0.10	11.80 & 12.01
Walnut Bend	37.4	0.37	11.92 & 12.06
Ward, N.	35.2	1.21	11.76 & 11.72
Wasson	34.2	1.90	11.72 & 11.65
West Columbia	28.4	0.19	11.54 & 11.62
Wyoming			
Byron	25.2	2.42	11.72 & 11.60
Elk Basin (Heavy)	31.5	1.72	11.61 & 11.49
Frannie	28.6	2.52	11.70 & 11.52
Grass Creek (Heavy)	24.7	2.72	11.70 & 11.48
Grass Creek (Light)	45.8	<0.10	11.80 & 12.02
Hamilton Dome	26.1	2.30	11.82 & 11.60
Lost Soldier	29.5	1.44	11.79 & 11.72
Oregon Basin	22.0	3.27	11.64 & 11.44
Salt Creek	33.2	0.24	11.72 & 11.92
Salt Creek	36.2	0.17	11.84 & 12.01

*Taken from Bureau of Mines Hempel distillations, Repts. Invest. 4289, etc.

†The first value is for distillate-like materials (504° F. boiling point) and the second for lubricating oils (756° F. boiling point).

Drilling in Western Nebraska

(Continued from page 146)

sists of 50 ft. of sand with black shale breaks in the sand. The shale breaks aggregate 16 ft. and the thickest one is 5 ft. thick. Between the first and second sands is 12 ft. of the black shale.

The second sand bench is 28 ft. thick and is a homogeneous sand without shale breaks. In all cases the second sand has contained salt water and drill-stem tests may show a small amount of gas. Forty-six feet of black shale separates the second bench of sand from the third.

The third bench of sand is 64 ft. thick and of fairly homogeneous sand. The top 22 ft., however, is usually very silty and nonporous.

Reservoir characteristics.—Generally speaking, the physical properties of the sandstones of the producing sections are excellent. The individual grains are rounded quartz grains which are not too tightly cemented. Porosities average in excess of 17 per cent, and some of the permeabilities exceed 1,000 md.

Crude oil from Gurley field is greenish brown and 35° gravity; it contains only 0.24 per cent sulfur; the viscosity at 100° F. is 59 seconds, and it pours down to 60° F. The Gurley oil contains some solution gas but it is undersaturated in the reservoir.

Huntsman Gas Field

Ohio moved away from Gurley field in November 1949 and located the 1 Cruise in 7-14n-49w, on a second structural feature known as the Huntsman. The Huntsman structure lies 8 miles southwest of Gurley field and is a feature with more than 100 ft. of independent closure. The drill topped the first sand bench of the so-called Dakota in 1 Cruise at 4,620 ft. and subsequent drill-stem tests showed the formation to be very tight.

The second sand carried water with some gas.

The third sand was found at a depth of 4,744 ft. and drill-stem tests through the entire sand section showed gas in quantity.

Drilling on the Cruise was carried into the Morrison to test the deeper Cretaceous sands but no commercial production was found below the third bench of the so-called Dakota.

After the 1 Cruise had been cleaned up, tests through the casing showed the well capable of making 54 million cubic feet of gas per day.

Drilling in Other Area

Next, Ohio moved about 1½ miles to the northwest from the Cruise and located the 1 Mather in 12-14n-50w. At the Mather location the first bench of so-called Dakota sand was found at 4,663 ft. and again the sand of the first bench was too tight and silty to produce.

The second bench carried water with some gas.

The third bench was topped at 4,802 ft. and 65 ft. of gas sand was drilled. The Mather has been completed for about 12,000,000 cu. ft. of gas through the tubing.

After the Mather, Ohio moved another 1½ miles to the northwest to locate the 1 Gurschke in 3-14n-50w. At the Gurschke, the first bench of so-called Dakota sand was topped at 4,719 ft. A drill-stem test from 4,720 to 4,730 ft. recovered 120 ft. of oil and gas-cut mud. This was similar to the recovery for the drill-stem tests at the Mather and Cruise in the top of the first sand bench. The next test, however, from 4,729 to 4,743 ft. recovered 3,094 ft. of heavily gas-cut green oil, 728 ft. of gasoline-cut oil and 91 ft. of water, with a gas flow of from 9,000 to 12,000 cu. ft. per day.

Third drill-stem test in the first sand bench from 4,743 to 4,758 ft. recovered 2,940 ft. of mud and gas-cut green oil with a gas flow of 15,000 cu. ft. of gas per day. The Gurschke well thus established the presence of oil in the first bench of sand on the Huntsman structure.

The second bench of sand in the Gurschke carried water, but the third bench again proved productive. The third bench of sand was entered at a minus 512-ft. sea-level datum or at a depth 65 ft. below the same stratigraphic position at 1 Cruise.

First drill-stem test in the third bench of sand was over the interval from 4,862 to 4,872 ft. and recovered 30 ft. of gas-cut mud and gas at the rate of 20,000 cu. ft. per day. Second drill-stem test from 4,872 to 4,885 ft. recovered 30 ft. of gasoline-cut mud and gas at a rate of 1,500,000 cu. ft. per day. The third drill-stem test from 4,886 to 4,900 ft. was made immediately under an 8-ft. shale break and the recovery measured 639 ft. of oil, 90 ft. of heavily gas-cut mud, 30 ft. of water, and gas at the rate of 20,000 cu. ft. per day.

Thus, the presence of oil in the third bench of sand was established on the Huntsman structure. Subsequent drilling and testing through the remainder of the third bench of sand did not establish a definite oil-water contact in the vicinity of the 1 Gurschke.

In conclusion, the writer points out that the Julesburg basin is one of the major structural basins in the United States, and that very little is known about it yet. He is confident that the future will, however, uncover further substantial reserves in the basin, and that the first chapter in its development is just closing.

Knock Ratings

(Continued from page 144)

tane number. Tetraethyl lead content varied from 0.0 to 3.0 cc. per gallon.

Distribution of fuels by research octane number is given in Table 1. Since only a small percentage of motor fuels now marketing exceed 90 research, a considerable number of the test fuels indicated in the range 90 to 95 research in Table 1 were specially prepared to furnish needed information in this range.

TABLE 1
Distribution of Test Fuels by Research Octane Number

Research octane number	Per cent of test fuels
75-80	32
80-85	36
85-90	25
90-95	7

Treatment of Test Results

Road knock ratings and motor octane numbers for all 375 test fuels are shown in Fig. 6. From even a casual inspection of these data, it is quite obvious that no sound correlation can be made. For example, with road ratings in the range of 75 to 85, motor octane numbers may vary eight or possibly more units for any particular road rating, and no correlation exists between the two sets of values. As a matter of fact, the variations are so great that an attempt to draw any curve through the points shown in Fig. 6 does not seem justified.

Data for the same test fuels are shown in terms of road knock ratings versus research octane numbers in Fig. 7. There is much better

TABLE 2—ACCURACY OF CORRELATION
Road Knock Rating vs. Research Octane Number

Deviation in road units	Per cent within given deviation
±1.0	66.0
±1.5	79.0
±2.0	88.1
±2.5	93.6
±3.0	95.5
Average deviation (road units)	±1.0
Maximum deviation (road units)	5.8

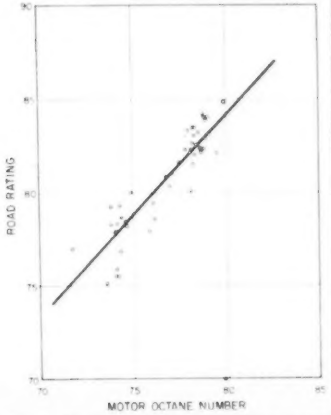
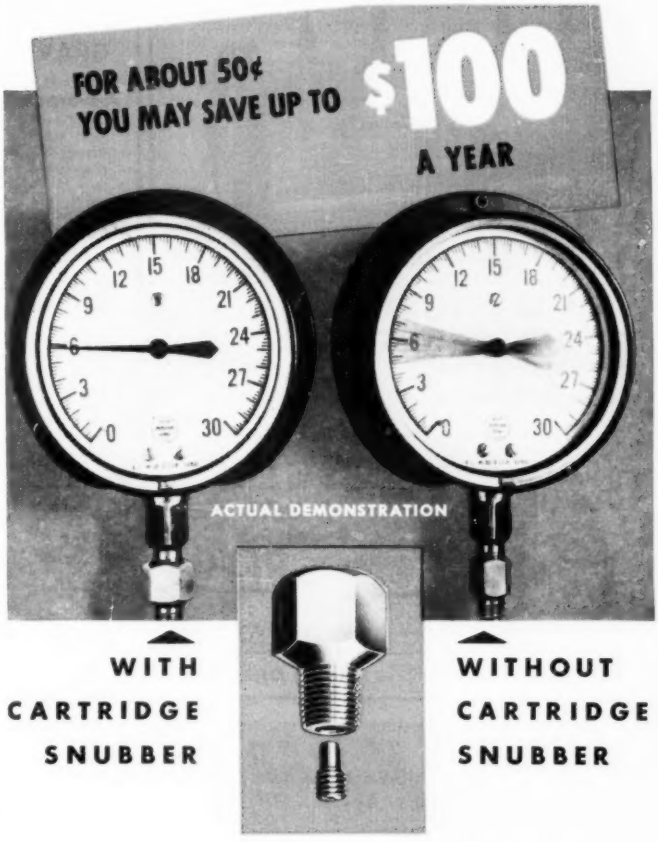


Fig. 8—Road (20 m.p.h.) versus motor rating for fuels within range 6.1 to 7.0 sensitivity.



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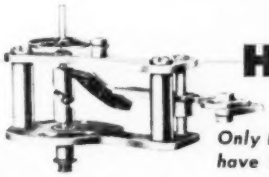

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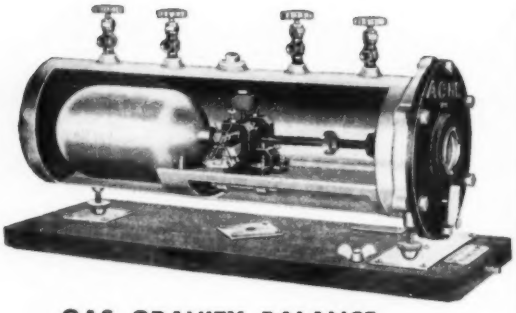

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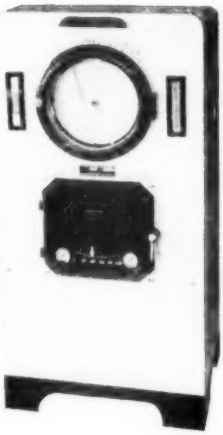

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agreement and considerably less scatter than in Fig. 6. In Fig. 7 the variations are reduced to such an extent that incorporation of all the data into a single curve is considered acceptable. Statistical treatment of these data permits estimation of road knocking performance from research values with the approximate accuracy given in Table 2.

The relatively good agreement between road and research values makes it possible to compare present-day conventional gasolines as utilized in current automobiles. It should be noted that the average deviation is ±1.0 unit road rating, which is considered entirely acceptable. The significance of ±1.0 unit average deviation is appreciated when it is compared with a similar measurement for laboratory knock-test methods, in which the accuracy is about ±0.4 unit, achieved under standardized and controlled conditions.

A detailed study of the individual observations indicates that under low-speed knocking conditions, a better correlation between the road and research ratings would be obtained by applying a correction based on the motor octane number. The fuels were divided into groups falling within sensitivity ranges of 0.1 to 1.0, 1.1 to 2.0, and so on to a maximum range of 12.1 to 13.0. Fig. 8 illustrates the relation between motor and low-speed road knock ratings for fuels having sensitivities within the range 6.1 to 7.0. Stated in another manner, research octane numbers for all fuels shown in Fig. 8 are 6.1 to 7.0 units higher than their respective motor octane numbers. Curves similar to that in Fig. 8 have been prepared for each of the sensitivity brackets from 0.1 to 13.0. These curves are assembled in Fig. 9, which illustrates the relation between motor and road knock ratings at constant sensitivity.

For the purposes of convenience, it is considered desirable to present these curves in terms of constant research rating rather than constant sensitivity. This step is illustrated in Fig. 9 by a curve developed for constant 87 research octane number (a value representing a mid-range rating). Fig. 10 shows complete curves for constant research ratings covering the range 73 to 97, and permits direct estimation of the road rating of a fuel from its research rating as corrected for its motor octane number.

Within the approximate range of 85 to 92 research it should be noted that fuels of constant research octane number but widely differing motor octane numbers will show the same low-speed road knock rating. For example, a fuel of 87 research and 84 motor octane number shows about an 86 road rating, which value is also indicated for a fuel of 87 research and only 76 motor octane number. Such a situation, while not common at this octane-number level, illustrates two different laboratory evaluations for fuels having a given road rating. A fuel testing 87 research and 76 motor would have to contain a large percentage of sensitive component stocks—such as catalytically cracked naphtha, polymer, or aromatics. A fuel testing 87 research and 84 motor would contain predominantly straightrun or virgin stocks. Low-speed road knocking performance would be about the same for either fuel, although the high-speed knock rating for gasoline of the straightrun type would be considerably greater than for the highly sensitive fuel.

In this connection, an automobile requiring 86 octane number at low speeds usually would not require more than about 76 to 78 at 50 or 60 m.p.h., and the sensitive fuel in all probability would satisfy these high-speed requirements. The straightrun fuel would possess high-speed antiknock quality not required.

By employing both motor and research octane numbers in conjunction with the curves in Fig. 10, road knocking performance can be estimated with the probable accuracy indicated in Table 3.

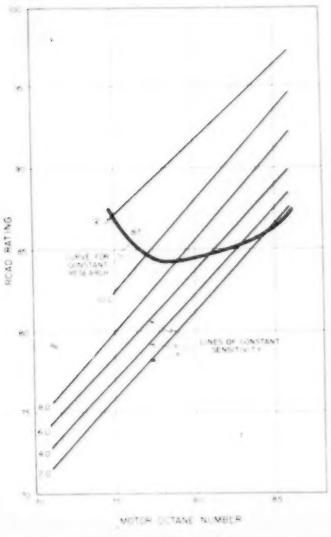
TABLE 3—ACCURACY OF CORRELATION
Road vs. Combined Motor and Research Octane Numbers

Deviation in road units	Per cent within given deviation
±1.0	68.3
±1.5	83.5
±2.0	92.5
±2.5	96.2
±3.0	97.5
Average deviation (road units)	±0.9
Maximum deviation (road units)	4.5

The use of both motor and research octane numbers for estimating low-speed road knocking performance represents a refinement over the use of research alone and effects an appreciable improvement in accuracy. Use of combined motor and research octane numbers for estimating low-speed road knock ratings appears justified when both ratings are readily available.

There are indications that additional fuel factors enter into the correlations between road and laboratory knock ratings. Probably the most important additional variable is the tetraethyllead content, although no quantitative evidence is available showing the effects of lead content on the relation between road and laboratory knock ratings.

It should be emphasized that overall road knocking performance is best evaluated in actual service. This applies particularly in the case of new engine designs or of fuels resulting from novel refinery processing methods. In such cases, low, intermediate, and high-speed knocking behavior must be evaluated completely in appropriate test cars on the highway. However, for comparison of conventional motor gasolines in currently available automobiles, the relation established between low-speed ratings and research octane numbers as modified by motor ratings is of undoubted value, and use of it is therefore recommended.



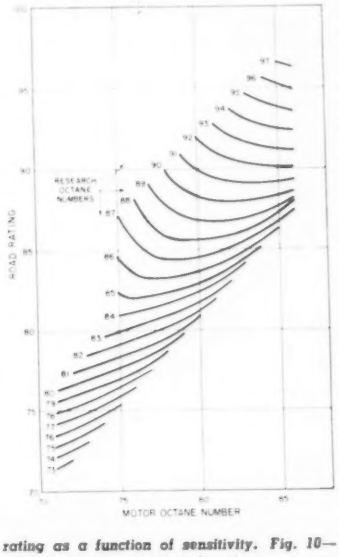


Fig. 9—(Left) Road (20 m.p.h.) versus motor rating as a function of sensitivity. Fig. 10—(Right) Road (20 m.p.h.) versus motor as a function of research rating.

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1. Veal, C. B., Best, H. W., Campbell, J. M., and Holaday, W. M., Antiknock Research Coordinates Laboratory and Road Tests, S.A.E. Transactions, 32, pp. 105-120 (1933).

2. Veal, C. B., 50,000 Car-Miles Run in 1934 Tests of Fuel Detonation Characteristics, S.A.E. Journal 35, No. 3, pp. 13-17, 28 (September 1934).

3. Campbell, J. M., Greenshields, R. J., and Holaday, W. M., 1940 Road Detonation Tests, S.A.E. Transactions 48, pp. 193-204 (1941).

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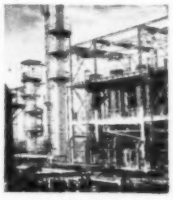

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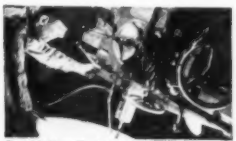

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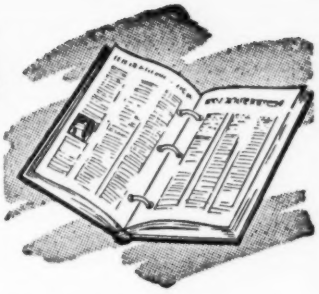

Control Valves

SINCE pneumatic transmission is widely used in refinery control systems, the final control element is most often an air-operated valve. Control valves on large lines or dampers may be hydraulically operated or a hydraulic or pneumatic piston mechanism may be used. In certain cases, as in remote location where compressed air is not available, the power unit for positioning the valve may be an electric motor. Solenoid operation, as a rule, is limited to on-off control.

Basic action.—A large variety of spring-loaded, pneumatic diaphragm valves are available as final control elements for refinery instrumentation. In the simplest form these are the so-called self-operated or self-acting control valves operating from the primary element for two-position control applications. Such valves have a slow speed of response and obviously a limited range of adjustment. Various forms of pneumatic relays have been developed. The control valve may be operated through a pilot-type pressure controller mounted on the diaphragm or from a separately mounted controller. In any case, the basic action is to convert a charge in the controlled variable-temperature, pressure, flow or liquid level—as "sensed" or measured by the primary element into a proportional air pressure. The output pressure from the air relay acts on the diaphragm in balance against the compression of a high-temper spring. The diaphragm, flexing with increase or decrease of air pressure, actuates a push-pull rod to which the valve stem is attached thus positioning the disk or plug of the inner valve. In effect, the force of the controller output air pressure on the diaphragm is balanced against the force of compression of the spring plus a force resulting from line pressure.

Types of Control Valves

Air to open or close. — Control valves may be specified as (a) "air-to-close," or (b) "air-to-open." For (a) the control valve is arranged so that an increase in air pressure on the diaphragm will act to close the valve. This means that if there is a failure of instrument air, load on the spring is released and the valve will open. In (b) the disk or plug is arranged in the reverse position so that increase in air to the diaphragm opens the valve. If air fails, release of load on the spring acts to close the valve. Sometimes the terms "direct acting" and "reverse acting" are used. Choice of valves (a) or (b) depends on the particular process and safety considerations. The process may be one in which protection against overheating is necessary. If the valve is controlling steam to a reboiler (Refiner's Notebook, March 9, 1950) it would obviously be an "air to open" valve or one which closes on air failure. If the valve is installed to regulate cooling water to a condenser (Refiner's Notebook, March 23, 1950) it should open on air failure.

Seating.—Control valves may also be single seated or double seated. The latter, also known as a "pressure balanced" valve, employs two disks or plugs so that the flow is divided between the two, pressure thrust is minimized and a "balanced" valve results. In a single-seated valve the pressure differential across the valve gives rise to a large unbalanced force, a condition which is particularly marked in large valves. The construction of the double-seated valve, with both disks or plugs traveling on the same valve stem, is obviously such that absolutely tight seating cannot be realized. Therefore, the general rule is to specify the single-seated valve where positive shut-off is required, where pressure drop is low, or where pressure does not vary considerably. Where there is considerable line-pressure fluctuation or for larger valves the double-seated type is usually specified. Thus double-seated valves are common for most refinery control applications.

Other variations.—Control valves are available in other variations including (1) finned valves, equipped with radiating fins for process control involving refrigeration (say under 20° F.) when valves might stick or for temperature applications in the range 350°-450° F. or higher when packing and lubrication may be seriously affected; (2) valves equipped with a manual wheel or lever acting through a plate on the diaphragm; (3) valves equipped with a travel indicator; (4) butterfly valves moving through 30°, 60°, or 90° angles to full open position, dampers, and other special types. In addition, control valves may be high or low lift and may differ according to the inner valve construction (Fig. 1).

Valve positioners. — In previous discussion of instrument application use of a valve positioner has been mentioned. The positioner is employed to maintain accurate movement of the valve stem corresponding to change in controller output pressure, under conditions where there is a large unbalanced force on the valve resulting from friction due to tight packing, or other cause. Various types of positioners are available with different arrangements of bellows and flexible baffles, or flapper-nozzle units, and relay or pilot valves. Basically, the positioner acts as an auxiliary relay so that a better response is obtained in the valve. Expressed in another way, since the force on the diaphragm is multiplied many fold, a sudden thrust on the valve due to an unbalanced force can be better resisted thus maintaining accuracy in the stem movement.

Fig. 1—Inner valve constructions. (1) Characterized V-port or skirted. V-port plugs may have equal percentage (logarithmic) or linear (parabolic) flow characteristics. (2) General drawing of a quick-opening plug. With tapered construction this would be a cone or ratio plug (characterized flow). (3) Throttle or parabolic plug (linear). (4) Parabolic plug (linear). (5) Quick-opening or beveled disk. Other constructions, not shown here, are available. Note combinations, e.g., (4) may be combined with (1) in a double-seated valve.

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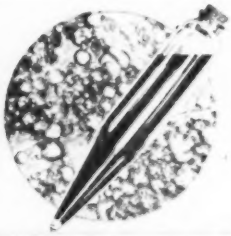

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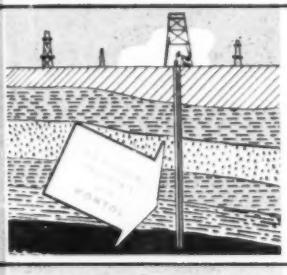

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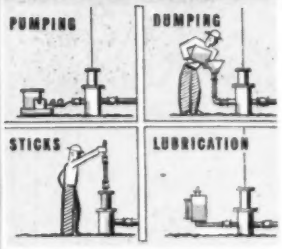

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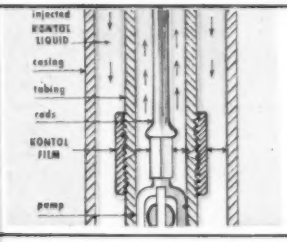

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ENGINEERING fundamentals

Permeability, Porosity Variations

RESERVOIR rocks are generally found to be nonhomogeneous in physical properties. The coring of a well has as one of its purposes, therefore, the determination of variation in physical properties as well as the absolute values of physical properties.

The usual means of expressing these variations is a plot of the desired property against the depth from which the sample was taken. In some graphs of this nature it is common to connect the individual points by lines to indicate the average between points. Other graphs represent the value by a bar covering the interval. The former type is shown in Fig. 1, for example.[1]

The variation to be expected in such a property as permeability is primarily dependent upon the depositional and geologic changes occurring during the formation of the reservoir rock. It is hoped, therefore, that an examination of a representation such as Fig. 1 will yield information concerning the history of rock formation or that the changes shown can be correlated with visible changes in rock texture or type.

The variations can also be examined from a statistical standpoint in an effort to show uniformity and type of depositional variation without a knowledge of the process of forming the rock. A study of such statistical variations might also yield valuable information as to show many samples are necessary to describe the variation over the complete reservoir and whether the desired information can be obtained from only one cored well.

Techniques for representing the distributions within systems which are nonuniform have been worked out on a basis of probability. A number of distribution types are recognized. Perhaps the most common is the so-called "normal" distribution. Fig. 2 is a typical normal distribution, the x axis representing the magnitude of a definite variable in the system and the y axis the frequency with which that magnitude occurs. This might for instance be permeability plotted on the x axis and the number of samples having that permeability plotted on the y axis. A normal distribution is always symmetrical about a "mean value" which is the arithmetic average of all measurements of the x variable. The mean value is also the most probable value of the variable. In examining experimental data the variations usually do not form a continuous curve and can better be represented by dividing the variations into groups. It is customary to express this grouping as a "histogram" which is the steplike graph shown by the dotted lines in Fig. 2. Each step represents the total number of occurrences of the variable within interval plotted on x axis.

Fig. 3 shows by two histograms the variation of porosity and permeability in the cored well of Fig. 1. From Fig. 1 there are noted the total number of samples which have a permeability or porosity within each of the intervals plotted on the x axis. It is necessary to use total number of samples rather than the footage represented because it is impossible to say what the values of permeability or porosity would have been in the intervals omitted.

Neither of the histograms of Fig. 3 appears to be "normal." That is, a regular curve like Fig. 2 would not very readily represent either one of the stepwise graphs.

The histograms reveal at a glance the spread of the property being considered and the probability that a new sample taken anywhere in the core will have a particular value. For example, the probability that a new sample would have a permeability in the interval 40-80 md. would be 14 32 or 44 per cent. A new sample taken for porosity would have a probability of 22 33 or 67 per cent of being between 18 and 24 per cent.

Reference

1. U.S.B.M., R.I. 3715, page 84.

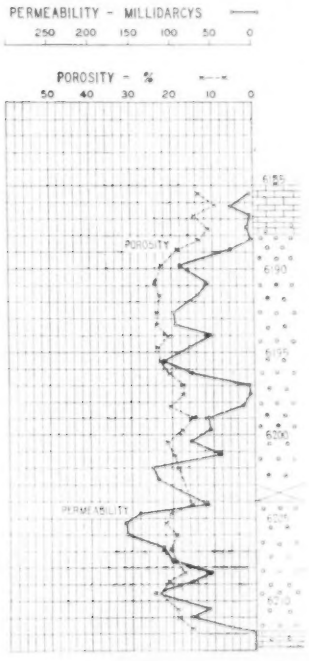

Fig. 1

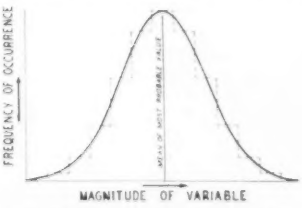

Fig. 2—Normal distribution curve and histogram representation.

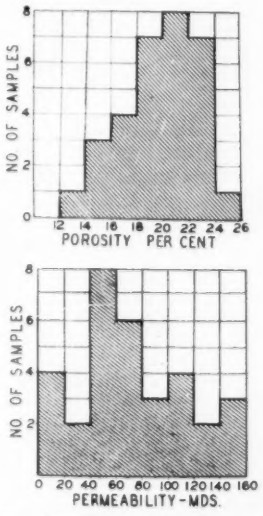

Fig. 3—Porosity and permeability variations expressed in histograms.

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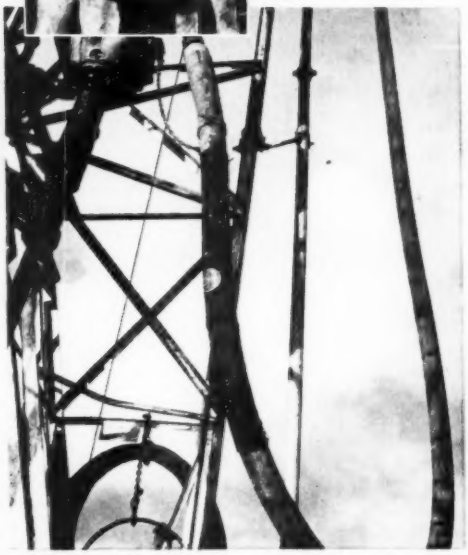

Developed as a companion to Goodall Long Life Flex-Cord Rotary hose to further increase rotary hose life, Goodall Rubber Hide Rotary Hose Protectors prevent girts and tong lines from cutting through the cover on your hose. After the first trip . . . when you have determined where girts or tong lines will bump or rub hose . . . put GOODALL RUBBER-HIDE at the point where the abrasion occurs. Rubber-Hide can be laced into place at any point along your rotary hose. Sufficient lacings are supplied.

Rubber-Hide is manufactured in 6' lengths to fit 2½" and 3" hose. It can also be furnished in rolls of 60', convenient for cutting into any desired lengths. Goodall Rubber-Hide comes roll packed in compact corrugated paper boxes. Rubber-Hide is available from any supply store. 6' lengths $40.00. Buy yours today.

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TRENTON, N. J.

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OIL AND GAS EQUIPMENT *Digest*

IT'S NEW — CHECK IT

TRADE LITERATURE

1 A UNIVERSAL SERVICE FOR OIL REFINERIES, PETROLEUM, AND CHEMICAL PLANTS. This documented brochure explains the services of this firm of industrial heat-insulation applicators. Pictures of completed work in plants throughout the world are included. *Wm. Kenyon & Sons, Ltd.*

2 INVERTED VERTICAL ISOLATION SWITCHGEAR is a 2-color, 16-page book dealing with outdoor or indoor, metalclad units. Completely illustrated, the book, suitable for binding in a loose-leaf folder, lists many features of design. *Yorkshire Switchgear & Engineering Co., Ltd.*

3 STEEL AND ALLOY PLATE FABRICATION. Designed mainly for engineering personnel, this brochure offers a pictorial story of the fabrication of steel and alloy tanks and pressure vessels. Stainless steel, monel, nickel, copper, aluminum, Hastelloy, and clad steels are among the corrosion-resistant alloys presented. Also of special interest are comprehensive corrosion-data charts. *Nooter Corp.*

4 AIR-BALANCED PUMPING UNIT. Of particular interest to production men is a wide variety of installation photos together with operating characteristics of the unit. Comparative dynagraph cards showing relative polished-rod load ratings help to explain the air-balance system. *Lacy Oil Tool Co.*

5 BULLETIN A-470, a 16-page brochure presents the complete story of the Torque-Arm speed reducer, augmented by full-size photos of the entire mechanism and simplified selection tables. *Dodge Manufacturing Corp.*

6 HIGH-PRESSURE OIL AND GAS SEPARATORS. Bulletin 203, a four-page, two-color folder, is illustrated with photographs and cross-sectional drawings and contains specifications of high-pressure separators, as well as oil and gas capacity tables. *Peerless Manufacturing Co.*

7 TYPE "D" CASING HEAD describes the Type "D" casing head as a simple unit designed to seal off a single string of casing in wells of medium depths and pressures, where an independent tubing head is used to support the tubing. *National Supply Co.*

8 ROCK BITS. A new four-page folder illustrates and describes a complete line of patented rock bits, designed for deeper, high-speed operation. *Globe Oil Tools Co.*

9 TECHNICAL BULLETIN 50-2 describes and illustrates the Iso-Flow steam generator. It is a detailed summary of the design and operating characteristics and operating test data on a 30,000-lb. per hour steam-generator installation. *Petro-Chem Development Co.*

10 PARKERSBURG BOLTED TANKS. There is a complete discussion of all construction details of bolted tanks, tank accessories, and walkways and stairways in this well-

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OIL AND GAS EQUIPMENT Digest of NEW CHECK IT

prepared, 28-page book. It also includes load and deflection tables on flooring, tank stress charts, and specifications. *Parkersburg Rig and Reel Co.*

11 GUIDE FOR SELECTING OR DESIGNING V-BELT DRIVES. This 52-page book discusses design horsepower and speed ratios. All possible combination of stock drive are described and calculations for design are tabulated. *Gates Rubber Co.*

12 TYPE 100 AIRGREASER, a four-page brochure explains a new, fast, efficient, and economical pressure lubrication method for drilling rigs, pumps, compressor stations, and other installations incorporating a concentration of machinery. *Lucey Products Corp.*

13 K-D PURGERS FOR AIR, GAS, STEAM, AND VAPOR is a set of data sheets covering the specifications, for vertical or horizontal installation, and a description of the action. *Kep-Dri Corp.*

14 RIGID LINE BLIND VALVES points out the advantages and applications of a rigid valve that features positive shutoff without pipeline movement. *Hamer Oil Tool Co.*

15 DUAL FUEL ENGINES features the simplified control and gas admission systems designed for economical fuel mixtures. Natural gas, butane, or butane-propane mixture, manufactured, or sewage gas all may be used efficiently in these engines ranging from 250 to 1,755 hp. at from 250 to 600 r.p.m. *Enterprise Engine & Foundry Co.*

16 PROFITS FOR EVERY FOOT YOU DRILL, HAUL, OR STRING. Prepared specifically for the petroleum industry, this four-page folder illustrates trak-wheels handling many difficult jobs over rough terrain. *Athey Products Corp.*

17 MAGNESIUM ANODES FOR CATHODIC PROTECTION is a multicolor brochure explaining the mechanics of corrosion, cathodic protection, and the potentials of galvanic anode materials. Diagrams describe the installation and proper location of magnesium anodes. *Apex Smelting Co.*

18 ASBESTOS PIPE LINE FELT, a four-page brochure, describes the use, quality, composition, and availability of felt pipe wrap. Requirements for traveling-type machines, mill and yard wrapping, and quantities per mile are presented in tabular form. *Gama Industries, Inc.*

19 SUSPENDED WALLS AND ROOFS illustrates and explains the advantages of these arch and wall structures for all boilers and industrial furnaces. Structural details and principal shapes are featured. *Liptak Furnace Arches, Ltd.*

20 PETROLEUM HORIZONS is a new 80-page book on processes and plants, featuring a step-by-step description and flow sheets for 31 refinery processes. Also gives complete details on background, organization, and world-wide services of the firm. *Lummus Co.*

21 MAINTAINING QUALITY STANDARDS IN INDUSTRY describes what Magnaflux is, how it works, where it is used, when it should be used, and who uses it. Magnaflux is a magnetic particle method of inspecting parts for defects. *Magnaflux Corp.*

22 CONTROL CORROSION WITH CARLON PLASTIC TUBING AND LINE PIPE includes, in addition to a price list, illustrations and data on results of existing installations. *Green Contracting & Engineering Co., Inc.*

23 INDICATING AND RECORDING THERMOMETERS, a two-color, four-page folder describes a full line of thermometers for every industrial use. *Electric Auto-Lite Co.*

24 ALTEN WONBOLT, JR., describes a new self-aligning polished-rod clamp that is secured with only one nut. It is small enough to revolve within polished-rod hanger and yet stronger than ordinary clamps twice its size. *Altens Foundry & Machine Works, Inc.*

25 SARAN RUBBER-LINED PIPE DATA SHEETS. Include price listings, by diameter, for both pipe and fittings from 8 to 24 in., applications, and engineering specifications. *Michigan Pipe Co.*

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OIL AND GAS EQUIPMENT Digest

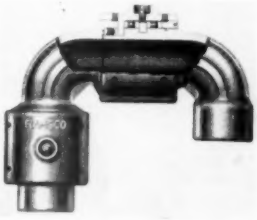
IT'S NEW ✓ CHECK IT

by Dan B. Miller

26 SERIES 50 PUMPING UNITS. The new adjustable counterbalance is safe and fast. One man on the ground, with one wrench, at one setting of the cranks, can adjust all four weights in a matter of minutes. Since all weights are adjusted with the cranks in the original position toward the post and the brake set, nothing is moved except the weight itself; this requires a minimum of effort by operator. Unit uses a step-down walking beam to provide a lowered tailboard bearing position. Posts are all of four-legged design, rigidly braced, jig assembled, and welded. Since the rear legs are closely spaced, it is possible to turn the gear box end for end and place the electric motor and drive under the samson post. Line is available in all A.P.I. sizes ranging from 40,000 to 320,000 in.-lb. torque rated reducers which are fitted to structures with A.P.I. ratings of 9,000 to 29,000 lb., and with reducer subbase optional. *Bethlehem Supply Co.*

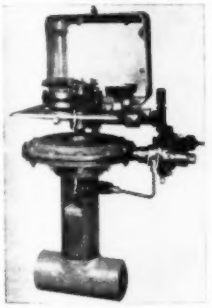
IT'S NEW ✓ CHECK IT

27 BALL-BEARING SWIVEL FITTINGS for free and easy rotation of 360° under pressure are made in the three following types: High pressure up to 15,000 psi. at 225° F. temperature. For pressure or vacuum lines. Low pressure, up to 1,000 psi. at 225° F. temperature. High-temperature, corrosive service, up to 1,000 psi. at 750° F. temperature, for steam, hot oil, asphalt, butane-propane, or other liquefied gases, and sulfuric acids, and other acids and caustics. Made in single, double, and triple-swing combinations, can be adapted to any piping requiring a flexible steel swing line. Swivel fittings for high-pressure and for high-temperature and corrosive service are available in sizes from ⅜ to 6-in. Sizes available on low-pressure fittings range from ⅜ to 14 in. *Rasmussen Manufacturing Co.*



IT'S NEW ✓ CHECK IT

28 GAS-LIFT VALVE TIME-CYCLE SURFACE-CONTROL UNIT features a new all-contained motor valve. The new motor valve, consisting of only three parts, is a simple and efficient time-cycle surface-control unit. The valve assembly may be removed and replaced in a valve in operation and the motor valve put back in operation in less than 5 minutes. Three vital parts are diaphragm motor assembly, valve case, and valve. Diaphragm assembly is anchored to a 5,000-cwt. cylindrical drip A tube within the drip conducts the diaphragm plate stem to its contact with the independent valve stem. Drip chamber is self-purging. The valve case is a 7-in. long cast-steel body, drilled for 2-in. line-pipe connections with 1-in. conductor tubes cored into the body. Valve itself is made of three parts: the seating insert, the valve stem and the stem sleeve through which the valve stem moves through an easily lubricated "O" ring packoff and a felt oil container. *Camco, Inc.*



IT'S NEW ✓ CHECK IT

29 DWELL-ETTE, an economical, prefabricated dwelling is delivered to the building site intact, ready to

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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be lived in. Some of its features are builtin cabinets, complete bathroom, plastic table tops, sliding doors, radiant heating, ample electrical outlets, fire-resistant shingle roofing, rock asbestos fireproof exterior walls, and welded-steel I-beam subframe. The unit is completely assembled at the factory. It is not delivered to the site in sections that must be assembled. Available in either one or two-bedroom sizes, either completely furnished or unfurnished. *Dwell-Ette Co.*

IT'S NEW CHECK IT

30 TOOL-JOINT THREADING ATTACHMENT will reduce threading time, and will disengage and stop

tool at the same place. Will cut close to shoulder without thread relief and with perfect safety. It automatically and simultaneously disengages half nuts and backs out tool on contact with stop. Can be set for external or internal threads, for right or left-hand threads, and for straight or tapered threads. An inexperienced operator can equal the speed of an expert. Can be furnished on any size or style of Lehmann lathe. In a test an inexperienced, blindfolded operator threaded a 4-in. tool joint in 15 minutes. *Lehmann Machine Co.*

IT'S NEW CHECK IT

31 MODEL 112 SAFETY RELIEF VALVE provides automatic, nonchatter, snap-open, snap-shut action. It embodies many features in design and construction providing for safer, more efficient pump or pressure relief and greater flexibility in operations than has ever been experienced in the field. The valve snaps open for instantaneous relief at full volume and a pressure less than overload pressure holds it open until a predetermined pressure drop causes it to snap shut and restore circulation. Permits quick changing of pressure settings. Within a normal range adjustments may be made simply by changing the detention wedges. All critical elements are made from corrosion-resistant materials or are given anticorrosion treatment. *Kinzbach Tool Co.*

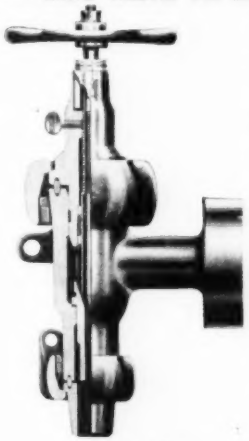
IT'S NEW CHECK IT

32 OK GLASS FIBER REINFORCEMENT. A new, greatly improved fabric with cross-weave reinforcement for added strength in all directions. Longitudinal strength is as great or greater than before, with a great increase in transverse strength. The uniform high porosity and penetration and other qualities of OK Reinforcement remain the same. *Middle West Coating & Supply.*

33 WILLIAMS COMPRESSOR HORSEPOWER COMPUTER is an instrument to solve gas-compressor problems quickly and easily. It is designed for compressor users in determining capacity, horsepower, suction and discharge pressures, compression ratio, clearance, and volumetric efficiency. Will determine horsepower needed to pump a desired rate of gas at known or assumed suction and discharge pressures; suction or discharge pressure required to pump a known rate of gas with given horsepower; volumetric efficiency and clearance; size of cylinders needed; horsepower being utilized in an operating compressor; speed to operate a compressor; and suction, intermediate, and discharge pressures in two-stage operations. *Willsonn Computers.*

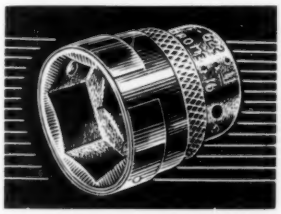
IT'S NEW CHECK IT

34 IMPROVED UNIBOLT ADJUSTABLE CHOKE OR WING VALVE. The stem packing is arranged to eliminate the need for further tightening after the valve is assembled at the factory. Adequate sealing compression is applied to the packing to assume a pressure-tight seal yet permit the stem to turn freely in the packing. Both the quality of the packing and the mechanical design of the compression assembly have been carefully selected and engineered to assure long service and easy operation. The new valve employs Unibolt couplings to assemble component parts, complete interchangeability of all parts, self-centering stem, and adequate flow area when used as a wing valve. *Thornhill-Craver Co.*



IT'S NEW CHECK IT

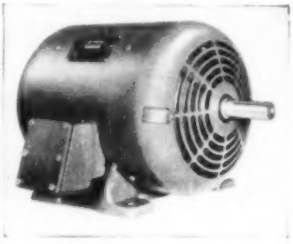
35 HOLD-IT SOCKET, designed with two spring-tension pins in the socket wall to firmly grasp and hold nut or plug. Useful for any socket job, the new Hold-It Socket eliminates the exasperation of dropping and losing nuts, plugs, and bolts in removing or in starting. At present the Hold-It Socket is available in 3/4 and 11/16-in., six-point sizes, with production on a wider



selection scheduled. *Herbrand, Division of Bingham-Herbrand Corp.*

IT'S NEW ✓ CHECK IT

36 CSP LIFE-LINE MOTORS are especially designed for applications where corrosive fumes and liquids are encountered. Frames, brackets, hoods, and other exposed parts are alkali cleaned, hot-water rinsed, then rinsed in chromic acid spray. After drying, they are sprayed with phenolic - alkyd - type enamel and baked. Additional protection is provided by a coat of gray enamel and two to four baked dips of thermoset varnish, followed by a final coat of gray lacquer. These motors use bronze split-hub, clamp-type blowers for corrosion resistance. Rotating neoprene slingers on the shafts between rear brackets and hoods are used to prevent the entrance of dirt or liquids into the bearing housings. Stator windings are double dipped and baked in thermoset varnish. All hardware is dipped in slushing compound prior to assembly. The gasketed conduit box can be rotated to meet installation requirements. *Westinghouse Electric Corp.*



IT'S NEW ✓ CHECK IT

37 AUTOMATIC PLUG VALVE LUBRICATOR will automatically lubricate any make of lubricated plug valve from ½ to 20 in. in size. It forces a measured amount of lubricant into the lubricating channels of the valve each time it is opened and closed. Composed of three simple stainless-steel parts, it is easily attached without making any alteration on the valve. The valve may be opened and closed 50 to 100 times before the reservoir must again be filled. To reset and refill with lubricant takes only a few seconds. Hose connection is snapped on the top fitting, the plunger handle is given a few strokes, and the reservoir is filled. *Delta Engineering Sales Co.*

IT'S NEW ✓ CHECK IT

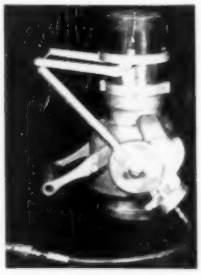
38 ALL-PURPOSE PIPE PROTECTORS are specifically designed by United States Rubber Co. to prevent casing and tool-joint wear and to lower vibration, friction, and torque during drilling operations. They are constructed of oil-resistant rubber compounds which can be used with all types of drilling mud. Field tests have shown that they have exceptional resistance to cutting, abrasion, swelling, and the deteriorating effects of oil and acid. A streamlined end design minimizes the swirling, turbulent action of the mud which commonly causes abrasive "ringing" of the pipe at end points. Inside of each protector has a special antislip knurled finish, and four special wiper rings provide additional protection against mud seepage and slippage on the drill pipe. A special applicator has been developed which will reduce drastically the shutdown time needed for installation. *Goode Equipment Co.*

IT'S NEW ✓ CHECK IT

39 SAFEWAY HAND HOISTS are made in capacities from ½ to 4 tons with an unusual degree of safety, efficiency, and portability. They are compact, close headroom, lightweight, and easy to handle in tight places. Construction features simplicity of design, modern gear drive, Weston type brake, steel load chain, steel housing, self-lubrication, and drop-forged top and bottom hooks. High safety factor against possible impact loadings and portability, combined with an increased strength makes them adaptable for many uses. *Wright Hoist Division, American Chain & Cable Co., Inc.*

IT'S NEW ✓ CHECK IT

40 QUICK-COUPLER designed for bottom loading of tank trucks, attaches to the loading dock supply line with a 3-in. synthetic rubber hose of burst pressure of not less than 2½ times static input-line pressure. Main valve and poppet assemblies are designed to minimize wear in the presence of nonlubricating liquids. Design also eliminates possible malfunctioning and provides the ease of operation required with either dead-man control or automatic shutoff. The nose seal and the main valve seat allow no leakage either at high or low pressures. The advantages of this method of loading are the reduction of vaporization losses and elimination of overhead loading racks. *Sheffield Instrument Corp.*



IT'S NEW ✓ CHECK IT

41 NEW PRISM-TYPE OIL GAGE MADE OF PLASTIC. A new prism-type gage to show the amount of oil in the reservoir of McCord lubricators has been adopted for use on "SF" lubricators. Because of the angle of the prism and the refractive qualities of the transparent plastic much better visibility is obtained. *McCord Corp.*

IT'S NEW ✓ CHECK IT

42 FORMULA 353 is an improved diesel steam-generator treatment of superior sludge-conditioning qualities. It provides greater corrosion protection of coils. It is a powdered treatment, rapidly and completely soluble, designed to satisfy all the complex requirements for feedwater conditioning of steam generators by internal methods. It neutralizes dissolved oxygen, reducing corrosion of outer coils and increasing their service life. Fluidity of sludge is improved, serving to coagulate mud and sludge reaching the steam separator, increasing the rate at which suspended solids settle in the water-storage tanks. The amount of sludge recirculated through the generator is thereby reduced, with subsequent reduction of interference with controls and strainers. *Dearborn Chemical Co.*

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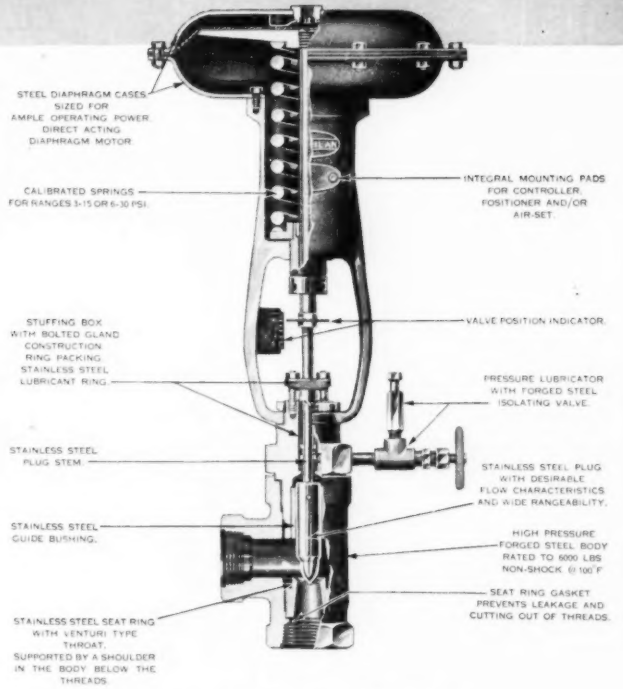
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STAINLESS STEEL PLUG STEM.
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HIGH PRESSURE FORGED STEEL BODY RATED TO 6000 LBS NON-SHOCK @ 100°F
SEAT RING GASKET PREVENTS LEAKAGE AND CUTTING OUT OF THREADS.
STAINLESS STEEL SEAT RING WITH VENTURI TYPE THROAT. SUPPORTED BY A SHOULDER IN THE BODY BELOW THE THREADS.

These tough, rugged control valves are especially designed for high pressure reducing or back pressure service. Built to exacting standards of quality materials, they assure dependable performance under the most severe operating conditions. They can be used in steam, water, oil, gas or chemical service.

These control valves may be operated by any suitable controller. Mounting pads are provided on spring barrel for instrument, positioner and or air set. Investigate these Masoneilan high pressure Control Valves.

No. 137-5 Control Valve

SPECIFICATIONS

BODY

Material — Angle Types — forged steel; Globe Types — cast steel.
Ratings — Angle Types: 6000 psi at 100°F., 2500 psi at 750°F.; 3000 psi at 100°F., 1500 psi at 750°F. Globe Types: 3000 psi at 100°F., 1000 psi at 750°F.
Sizes — 1", 1½" and 2", Screwed connections.

TRIM

Material — Stainless steel plug, seat ring, plug stem, guide bushing and lubricant ring.
Also available: 500 Brinell hardness AISI Type 440-C steel plug and seat ring; or stellite faced plug and seat ring.
Orifice Sizes — For 1" Valves — ¼", ⅜", ½", ¾". For 1½" and 2" Valves — ¼", ⅜", ½", ¾", 1".

DIAPHRAGM MOTOR

Action — Direct action (air-to-close) is standard. Reverse action (air-to-open) available.
Materials — Diaphragm cases — steel. Diaphragm — neoprene or rubber.

LUBRICATOR

¼" pressure lubricator with forged steel isolating valve.

AIR-FIN BONNET

Available — not standard.

SPRING RANGES

3-15 psi standard.
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Of all design features and qualities required in a petroleum processing furnace uniform heat distribution is the basic requirement for efficient operation, minimum tube corrosion and resultant low-cost maintenance.

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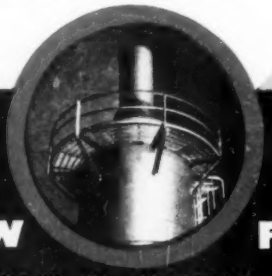

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REFINING

Products From Peat

WASHINGTON.—Producer gas, hydrocarbons, and synthetic rubber are among the products that can be developed from peat, a House public-lands subcommittee was told last week during hearings on bills to appropriate up to $3,500,000 to inaugurate a Bureau of Mines study of the utilization of peat byproducts.

Testifying in favor of the legislation, introduced by Rep. Fred Marshall of Minnesota, Dr. Derson Shybekay, president of the Industrial Research Council of America, said the United States has about 15 billion tons of peat scattered in a number of states, much of it in areas which have to import coal from long distances, which could be used for fuel or processed into more than a score of products.

"Rather successful" research, he said, is now in progress on the use of peat to produce synthetic rubber, and it can also be used to produce hydrocarbons, although apparently no great amount of work has yet been done in that field.

New Products Terminal

ST. LOUIS.—Construction has begun on a new 9,000,000-gal. petroleum-products terminal by Martin Oil Co., Carbondale, Ill., at the foot of Potomac Street here. It will be one of the largest and most modern terminals in the St. Louis metropolitan area.

The facilities will be in operation by September. Tankage includes three 55,000-bbl. and two 25,000-bbl. tanks for requirements of the company's own business and for trade. The company also operates a terminal at Cairo, Ill.

Warm Your Engine

Sinclair Refining Co. scientists advised motorists last week that engine corrosion may be abetted by warming the engine to 180°-200° F. before driving.

Use of higher-octane gasoline has increased gum formations in automobile engines, the scientists declared, and low water-jacket temperature during the warm-up period was listed as one of the principal causes of corrosion.

Addition of a metal deactivator to gasoline reduces gum formation to a minimum, it was stated.

Tax-Collection Record

WASHINGTON.—Federal gasoline-tax collections hit a new high of $53,983,522 in March, $16,000,000 above the February receipts of $37,654,712 and $11,000,000 above the $42,754,543 secured in March, 1949, its was reported last week by the Internal Revenue Bureau.

Collections for lubricating oil also were up, $7,860,833 against $5,709,664 in February and $6,978,318 in March of last year, but receipts from pipeline transportation fell off, amount-

NELSON REFINERY-CONSTRUCTION INDEX

Appears in the first issue of each month.
Explanation—Cost-imating No. 61, December 15, 1949, pages 91, 92.
Compiled by W. L. Nelson—Refinery Consultant—Tulsa.
Indexes of Individual Equipment Items—January, April, July, October.

INDEX (1946 = 100)

	1947	1948	1949	Jan. 1950
Centrifugal pumps	109	120.0	118.9	123.7
Reciprocating pumps	*128.5	*138.1	144.6	139.6
Compressor	114	128.0	120.0	117.0
Engines	109	120.0	115.5	113.2
Motors	*110	*112.7	114.0	114.2
Transformers	*116	*116.0	116.0	116.0
Instruments	113	120.0	122.0	123.1
Miscellaneous equipment average	*114.2	*122.1	121.6	121.0
Materials component	*122.4	*139.5	143.6	143.9
Labor component	113.5	128.0	137.1	140.3
Refinery-construction index	*117.0	*132.5	139.6	141.6

*Revised.

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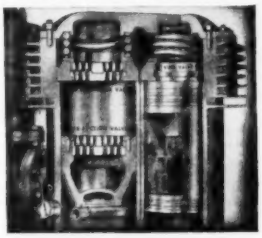

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ing to $1,467,100 against $1,872,019 and $1,934,308, the bureau announced.

For the first 9 months of the Government's fiscal year, gasoline-tax collections were up $25,000,000 to $406,086,272 against $380,382,185 a year ago, and for the first quarter of the calendar year alone showed an increase of $14,000,000 to $80,002,001 against $65,942,862 last year.

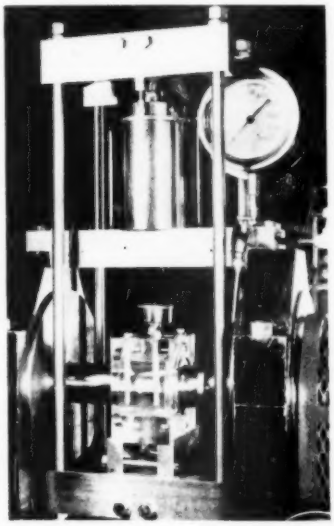
Receipts from lubricating oils and pipe-line transportation, however, showed losses for the 9-month period, the former dropping to $56,948,695 from $59,360,456 and the latter to $14,029,167 from $14,638,703, but for the first quarter this year, while lubricating oil dropped to $10,558,658 from $12,410,648 in 1949, pipe-line transportation taxes increased to $3,159,288 from $2,741,682, bureau records showed.

Security Bill Changed

WASHINGTON. — The Senate finance committee has decided that distributors of petroleum products shall not be considered employes of the companies whose goods they handle. It will cut out of the bill, already passed by the House, provisions which would have brought them under the Social Security Act.

The committee, however, will leave the way open for wholesale oil distributors and filling-station operators to secure social security coverage, but as self-employed persons and paying higher old-age pension taxes than employes.

Provisions of the House bill which industry members feared would make all wholesale and retail distributors employes of the companies whose banners they flew were vigorously attacked at hearings before the Senate committee. Representatives of a number of marketing organizations and J. Howard Marshall, president of Ashland Oil & Refining Co., as spokesman for the refiners, declared the bill threatened the independence of thousands of men who thought they were in business for themselves.



***PLASTIC BEARING.**—The Texas Co. has built a transparent plastic bearing for lubrication studies which enables engineers to see and photograph behavior of oils and greases in bearings under different loads and speeds. Red dye is mixed with the lubricant so lines of flow can be followed. The machine can be adapted to study journal, ball, and roller bearings. It was designed and built at research laboratories at Beacon, N. Y.*

New Unit Formed

CLEVELAND.—The U. S. Army's 981st Quartermaster Petroleum Products Base Laboratory, affiliated with Standard Oil Co. (Ohio), has become the first quartermaster unit in the Cleveland area to achieve fully organized status following Army inspection.

Commanded by Lt. Roger W. Serne, laboratory technician at Sohio's No. 1 refinery, the unit is designed to provide administrative and technical personnel for establishment of a laboratory at any Army base in event of national emergency.

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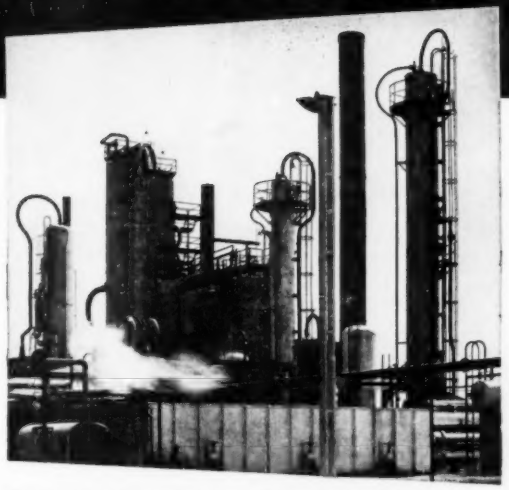

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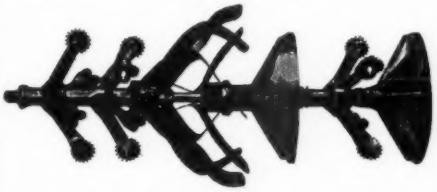

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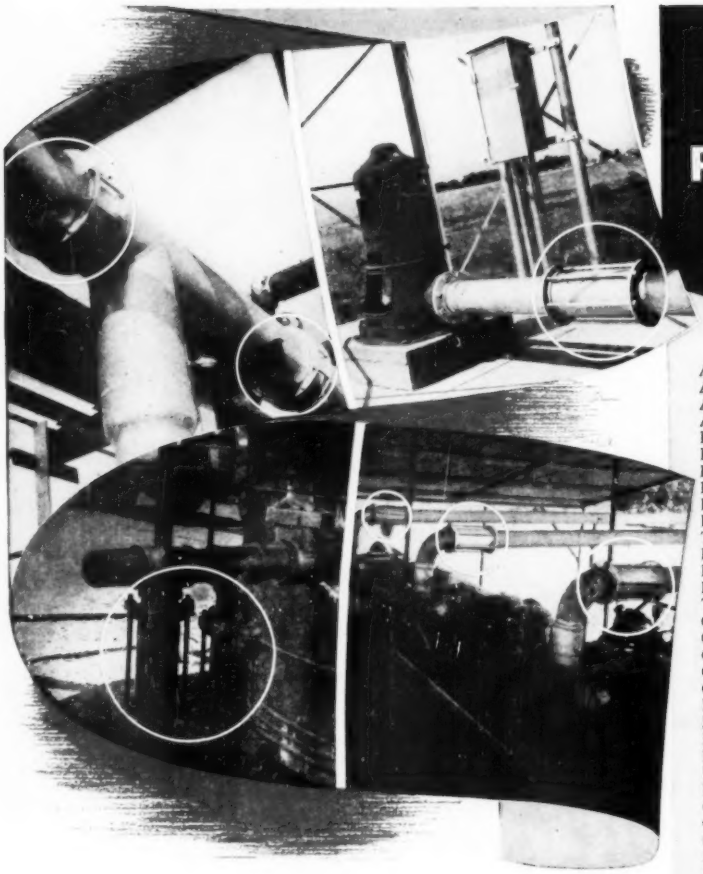

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PIPE LINES

Transco Expansion

FPC gives approval to boost line capacity

WASHINGTON. — Transcontinental Gas Pipe Line Corp., Houston, has been authorized by the Federal Power Commission to expand capacity of its Texas-to-New York City natural-gas pipe line from 340,000,000 cu. ft. daily to a total of 505,000,000 cu. ft. daily.

Termed "Plan 2" by Transco, the project increases total estimated expenditures from $191,500,000 to $240,000,000.

The 2,400-mile line includes 1,800 miles of main and 600 miles of gathering lines, and will reach from the Rio Grande Valley of Texas to the New York City metropolitan area.

The first 605-mile section of line, including five compressor stations, was completed in early March. All contracts have been let and work is now in progress.

(A special Transcontinental section will be found in this issue, beginning on page 81.)

Mid-Valley Progress

In the laying of pipe for the southwest division of Mid-Valley Pipe Line Co.'s project, 223 miles had been laid by April 21 including 26 miles of 22-in., 42 miles of 12-in., 123 miles of 20-in., 20 miles of 8-in., and 12 miles of 6-in.

Contractors are operating as follows: O. R. Burden Construction Co., 60 miles, 20-in., Longview, Tex., to Red River, field office, Marshall, Tex.; Latex Construction Co., 40 miles, 20-in., Red River to Haynesville, La., field office, Haynesville; Associated Pipe Line Contractors, Inc., 112 miles, 22-in.; Mayerville, Miss., to Pope, Miss., field office, Charleston, Miss.; Houston Contracting Co., 100 miles, 22-in., Pope, Miss., to Henderson, Tenn., field office, Batesville, Miss.

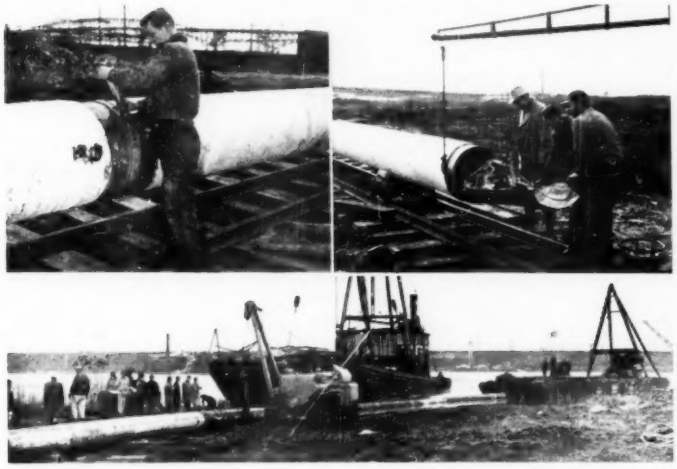
Bids Invited

Southern Natural seeks work on 237 miles

BIRMINGHAM.—Specifications with requests for bids have been mailed to contractors by Southern Natural Gas Co. covering a total of 237 miles of natural-gas lines, R. H. Ulrich, vice president, reported last week. Included are invitations covering 24 miles of 24-in., 180 miles of 18-in., and 33 miles of 16-in.

These bids are part of the construction program which Southern Natural hopes to undertake this year, Ulrich said, and requests for bids are to be issued from time to time in the future for further construction work.

The company filed with Federal Power Commission in Washington, D. C., sometime ago a request for permission to construct a total of



Courtesy of Taylor Forge and Pipe Works.

Laying crossing at Passaic River in New Jersey for Transcontinental Gas Pipe Line Co. Upper left: Wrapping insulated film for X-ray photo-inspection. Upper right: Insertive X-ray equipment in pipe. Below: Padded roller equipment supports pipe on rails for sliding pipe into the water.

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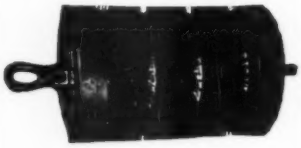

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375 miles of 24-in. line from Gwinville, Miss., to Atlanta, and planned a 225-mile 16-in. Colfax, Ga., extension. Also included in the request was 110 miles of 11-in., 314 miles of 18-in., 171 miles of 16-in., and 118 miles of 13-in., all extensions to the line. However, Ulrich said that this project has not yet been authorized and that in recent weeks his company has filed with FPC an application (Docket G-1308) requesting certificate for building the following facilities:

Scheduled for 1950.—180 miles 18-in. Gwinville, Miss., to Selma, Ala.; 26 miles of 16-in., Selma to Marvin Gate, Ala.; 29 miles of 12-in., Carthage, Tex., to Logansport, La.; 14 miles of 14-in., Logansport to Perryville, La.; 5.8 miles of 8-in., Carthage field, Texas; 13.2 miles 24-in., Benton-Pickens loop in Louisiana; 4 miles of 24-in., Coosa-Talladega loop, in Louisiana; 4 miles of 24-in., Tallapoosa-Bowden loop in Louisiana; 11 miles of 6-in., Vicksburg loop in Mississippi; 6.2 miles of 12-in., Macon line loop, in Georgia; and the following connecting lines: 5 miles 8-in., Meridian, Miss.; 1 mile of 8-in., Demopolis, Ala.; 35 miles 8-in., LaGrange, Ga.; 6.3 miles 6-in., Lanett, Ala.; 6.2 miles 8-in., Mississippi Chemicals Co. plant; 22 miles 8-in., Childersburg, Ala.; 2 miles of 6-in., Beaunit Mills; and 12.6 miles of 12-in., Yates plant.

Scheduled for 1951.—45.6 miles 18-in., and 22.9 miles 16-in., Selma to Marvin Gate, Ala.; 98.1 miles 16-in., Marvin Gate to Bolingbroke, Ala.; 105 miles 10-in., Bolingbroke Gate to Augusta, Ga.; 19 miles 8-in., Augusta to Aiken, Ga., 27.2 miles 14-in., and 36.9 miles 14-in., Logansport to Perryville, La.; 21.4 miles 24-in., Perryville-Pioneer loop in Louisiana; 14.4 miles 24-in., Onward Big Sunflower loop, in Louisiana; and the following connecting lines: 18.8 miles 6-in. Grandville, Ga.; and 15.5 miles 4-in., Sandersville, Ga.

New Line Proposed

WASHINGTON.—Central Kentucky Natural Gas Co., Charleston, W. Va., is seeking Federal Power Commission authority to build 32 miles of 20-in. loop extending from North Means, Ky., northwesterly to a point in Nicholas County, Kentucky. The company also wants to install an 880-hp. gas-engine-driven compressor unit at its North Means compressor station.

Estimated cost of the entire construction program is $2,195,000. It would increase capacity of the firm's system from 191,500,000 cu. ft. daily to an estimated 229,500,000 cu. ft. daily. Additional gas would be received from Tennessee Gas Transmission Co.

Central Kentucky proposes to finance the project by the issuance and sale of 3¼ per cent promissory notes to its parent company, Columbia Gas System, Inc.

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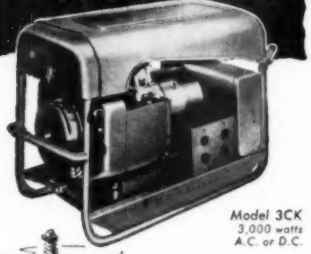

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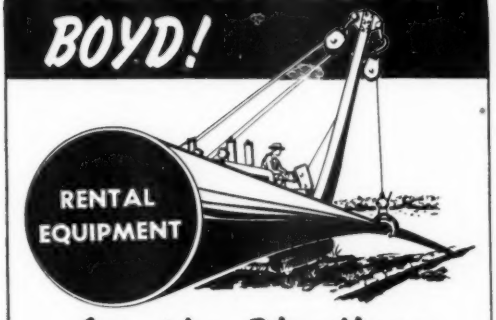

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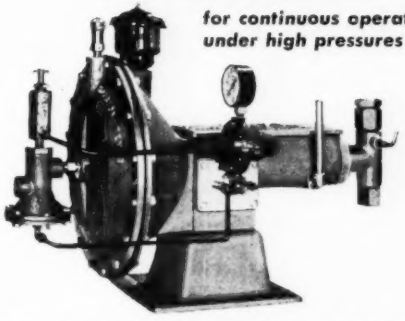

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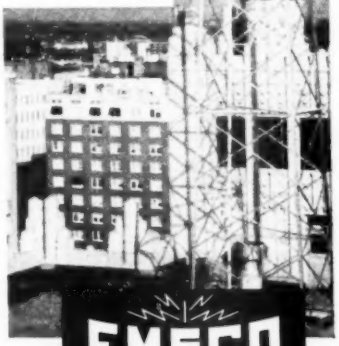

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Pipe-Line Construction

FOLLOWING is a tabulation of domestic pipe-line projects which are planned or under construction. Included are crude-oil, products, and natural-gas lines. The list was compiled from surveys made by The Oil and Gas Journal.

Crude-Oil Pipe Lines

Gulf Refining Co.—29 miles 8-10-in. lateral in Scurry County, Texas, under construction; Latex Construction Co., contractor; J. B. Latham, superintendent; field office, Loraine, Tex.

Humble Pipe Line Co.—371 miles, 18-in., under way, West Texas-Satsuma Station to Baytown, Tex.; 178-mile western section contracted to Morrison Construction Co.; 193-mile eastern section contracted by Anderson Brothers Corp.

Magnolia Petroleum Co.—60 miles 4-24-in. gathering system in La Ward and Lolita fields, Texas; Henry L. Lemons & Co., contractor; W. A. Remington in charge.

Mid-Valley Pipe Line Co. (Sun and Sohio)—1,000 miles, 20-22-in., under way, Longview, Tex., to Mayersville, Miss.-Covington, Ky., to Lima, Ohio. Contracts let for 857 miles as follows: Section 2, Haynesville, La., to Mayersville, Miss., Latex Construction Co.; spread office, Farmerville, La.; F. A. Silar, general superintendent; W. A. Briley, spread superintendent; office at Haynesville, La., W. H. Hayes, superintendent; M. L. Thompson, assistant superintendent. 41 miles, 12-in., lateral, Delhi to Lake Providence, La.; headquarters, Lake Providence; E. C. Norris, general superintendent; R. E. Thornton, superintendent. Section 3-A, Mayersville to Oakland, Miss., Associated Pipe Line Contractors, Inc.; J. A. Williams and L. H. Gray, spreadmen; Section 3-B, 4-A, Oakland, Miss., to Henderson, Tenn., Houston Contracting Co., E. C. Norris, superintendent; field office, Batesville, Miss.; Section 4-B, 5-A, Henderson to Clarksville, Tenn., Eastern Construction Co.; work started April 1; to be completed by September 1, 1950. Louie Stewart and Cliff Simmons, spreadmen; field offices, Clarksville and Lexington, Tenn. Section 5-B, 6-A, Clarksville, Tenn., to Elizabethtown, Ky., field office, Clarksville, Fred L. Byers, superintendent; Britton Construction Co.; Section 6-B, 111 miles of 22-in., Elizabethtown to Hebron, Ky., H. L. Gentry Construction Co., Frank Morris and Jim Mitchell, spreadmen; Section 7 South, Hebron, Ky., to Eaton, Ohio, Britton Construction Co., field office, Hamilton, Ohio; spreadman, Fred Peters; Section 7 North, Eaton to Lima, Ohio; Section 8, Magnolia, Ark., to Haynesville, La. Longview, Tex.-Haynesville, La., section, 110 miles 20-in., contracted to O. R. Burden Construction Co.; G. A. Lewis, spreadman; office, Marshall, Tex.

Cumberland and Tennessee rivers, Eastern Construction Co.; field office, Clarksville, Tenn., Fred L. Byers, spreadman.

Naph-Sol Refining Co.—25 miles 6-in., under construction, Kimball Lake oil field, Newaygo County, Michigan, to refinery at Muskegon; Young Construction Co., Olney, Ill., contractor.

Pan American Pipe Line Co.—80 miles, 10-in., southern part of Scurry County, Texas, to connect with Humble Pipe Line Co.'s system near San Angelo, Tex. Work to begin in May. (Contract not let.)

Phillips Petroleum Co.—45 miles 2-24-in., gathering system near Andrews, Tex.; Vaughn & Taylor Construction Co., contractor; Jess Moore in charge.

Pasotex Pipe Line Co.—32 miles 4-8-in., authorized, North Snyder, Tex., lines for gathering, delivery to Basin System.

Portland Pipe Line Co., Montreal Pipe Line Co., Ltd.—236 miles, 18-in., planned, Portland, Me., to Montreal, Que., Canada, contracted as follows: Oklahoma Contracting Co., 85 miles in Section 1 at southern end; Portland, Me., to Gorham, N. H.; H. A. Wylie, superintendent; Lisle W. Chambers, paymaster; office, Westbrook, Me.; work starts June 1. Associated Pipeline Contractors, Inc.; L. H. Gray, spreadman. Section 2, 81 miles; and Fred Mannix Co., Ltd., 68 miles, Section 3, in Canada.

Richfield Oil Corp.—40 miles, 10-in., Cuyama Valley-Newhall, Calif., planned. 60 miles, 14-in., applying field joints, Newhall-Wilmington, Calif., under way.

Stanolind Pipe Line Co.—36 miles, in Kent County, Texas, outlet for Scurry County crude.

Texas-Empire Pipe Line Co.—42 miles, 16-in., authorized, Wilmington, Ill., to East Chicago, Ind.; O. E. Burden Construction Co., contractor; Pete Hiner, spreadman; office, Wilmington, Ill.

Texas Pipe Line Co.—42 miles 12¾-in., Patoka, Ill., to Clay City, Ill.; L. R. Young Construction Co., contractor.

Texas-New Mexico Pipe Line Co.—37 miles, 10-in., proposed, Scurry County, Texas.

Products Pipe Lines

Great Lakes Pipe Line Co.—261 miles, 12-in., under way; contracted as follows: 52 miles, 15-in., Albert Lea to Fairbault, Minn.; under construction; Sheehan Pipe Line Construction Co., contractor; field office, Albert Lea, Minn.; C. W. Henderson, spreadman. 50 miles 12-in., St. Paul to Fairbault, Minn.; J. W. Brown, spreadman; office, Northfield, Minn. 50 miles 12-in., State Line to Fairbault, Minn., C. M. Brown, spreadman; office, Albert Lea, Minn. O. R. Burden Construction Co., 64 miles north from Des Moines; field office, Nevada, Iowa; G. D. Lewis, spreadman; A. C. Holder Construction Co., 72 miles to Iowa-Minnesota state line; Williams Brothers Corp., 20 miles, Mississippi River crossing and line to terminal and station. Kansas and Missouri river crossings, R. H. Fulton & Co.; field office, Kansas City; Ed Veach, spreadman.

Second 12-in. line to be constructed between Barnsdall, Okla., and Kansas City, Kans., paralleling the 12-in. recently completed, and three existing 8-in. lines. Work to start as soon as pipe is delivered.

290 miles, 12-in., Tulsa to Kansas City, Mo. Contracted as follows: 54 miles, Ponca City to Barnsdall, Okla., O. R. Borden Construction Co.; and 236 miles, Barnsdall, Okla.-Kansas City, Mo., Pacific Pipe Line & Engineers, Ltd. James Howe, superintendent for Pacific Pipe Line portion is headquartered at Chanute, Kans.; spread office at Tulsa with Ham Hamilton general spreadman and river-crossing spreadman; spread office at Dewey, Okla., Loue Robertson, spreadman; and spread office at Paola, Kans., Larry Webb, spreadman.

355 miles, 12-in., authorized, Kansas City through Omaha and Sioux City, Iowa, to Sioux Falls, S. D.

189 miles, 12-in., authorized, Kansas City to Des Moines, contracted as follows: 36 miles 12-in., Kansas City, Mo., northward through Platte, Neb.; Trojan Construction Co., contractor; field office, Parkville, Mo.; Swede Tillotson, spreadman; 37½ miles, 12-in. Clay, Clinton, DeKalb, and Daviess counties, Missouri; Trojan Construction Co., contractor; field office, Cameron, Mo.; Felix Johnson, spreadman; Brodie Con-

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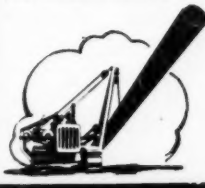

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struction Co., 37-mile middle section; field office, Bethany, Mo.; A. T. Rathjen, spreadman; R. H. Fulton & Co., two 38-mile northern sections, Osceola to Des Moines, Iowa; Jerry Nash, spreadman; office, Osceola.

48 miles, 8-in., authorized, Cushing-Drumright-Tulsa, Okla.; Trojan Construction Co., contractor; field office, Sapulpa, Okla.; Slim Deaver, spreadman.

Phillips Petroleum Co.—155 miles 6-in., extension to present 200-mile line from Phillips, Tex., to LaJunta, Colo., on to Denver.

Standard Oil Co. (Ohio).—38 miles 8-in., authorized, Toledo to Fostoria, Ohio.

Salt Lake Pipe Line Co.—242 miles, 6-8-in., Boise, Idaho-Pasco, Wash., planned. Contracted as follows: Morrison-Knudson Co., Inc., Macco Corp., and Bechtel Corp., 140-mile section from Boise to Baker, Idaho; Pacific Pipeline & Engineers, Ltd., Baker to Pasco, Wash. Pacific Pipeline & Engineers, Ltd.'s, field office, LaGrande, Ore.; L. E. Robertson, spreadman.

63 miles 8-in., Mountain Home to Boise, Idaho; Oklahoma Contracting Corp., contractor; Aldress Kilgore, supt.; R. F. Mueller, paymaster. Office, Mountain Home. Construction to begin May 1.

Natural-Gas Pipe Lines

Alabama-Tennessee Natural Gas Co.—30 miles 10-in., under way, Selmer, Tenn., to Muscle Shoals, Ala.; 35 miles 8-in., authorized, Muscle Shoals to Decatur, Ala.

Algonquin Gas Transmission Co.—276 miles, Lambertville, N. J., to Boston area, proposed.

492 miles laterals, New England area, proposed.

Atlantic Gulf Gas Co. (United Gas Pipe Line Co.)—1,530 miles, planned, Alabama-Florida-Georgia-South Carolina.

Central Hudson Gas & Electric Corp.—40 miles, authorized, Tuxedo, N. Y., station, Home Gas Co. line now under construction, to Poughkeepsie, N. Y.

Central Kentucky Natural Gas Co.—36 miles, 12-20-in., planned, Kentucky loops.

Chicago District Pipe Line Co.—41 miles, 24-in., planned, Joliet, Ill., to Chicago.

City of Indianapolis, Ind., Inc.—55 miles 16-in., proposed, Indianapolis to Texas Eastern Transmission Corp.'s system.

Cities Service Gas Co.—47 miles, 3-4-16-in., planned, in Kansas.

Coastal Pipe Line Co.—1,000 miles, planned, Texas to Norfolk, Va.

Colorado-Wyoming Gas Co.—41 miles, planned, Greeley, LaSalle, and Windsor, Colo., areas.

Commonwealth Natural Gas Corp.—537 miles, 20-in., planned, West Bend, Ky., to Norfolk, Va.

200 miles, authorized, Green County, Virginia, to Norfolk.

East Tennessee Natural Gas Co.—185 miles, 16-in., Lobelville-Chattanooga, Tenn., contracted by Walters & Saigh Construction Co., for construction in 1950; 120 miles, 12-in., Chatanooga-Knoxville, Tenn.; contracted by Walter and Saigh Construction Co., for construction in 1950; 100 miles of laterals to be laid in 1950. Construction 150 miles, 16-in., Knoxville-Bristol, Tenn., under consideration.

El Paso Natural Gas Co.—All work done by company crews.

Looping of 26-in., New Mexico-California line and connection with Pacific Gas & Electric Co. at Needles, Calif. 352 miles 30-in., completion November 1950; spreads as follows: 119 miles 30-in., Wenden to Topock, Ariz., Ed Alsup, spreadman; office, Salome, Ariz.; (Spread No. 2 is shut down due to lack of pipe; office, Jal, N. M., Jack Smith, spreadman); 15 miles 2-in., Bowie, Ariz.; G. George, spreadman; office, Casa

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Jackson, Miss. Harrisburg, Pa.

Grande, Ariz. In July company will continue two spreads on 30-in. loop project which lacks 169 miles for completion.

450 miles, 30-in., under construction, Eunice, N. M.-Blythe, Calif., looping; completion March 1950.

450 miles, 24-in., planned, San Juan basin, New Mexico to Franconia, Ariz.

Home Gas Co.—70 miles, planned, Orange, Sullivan-Rockland counties, New York-Cattaraugus County, New York, areas.

Jersey Central Power & Light Co.—39.4 miles, 10-in., planned, New Jersey to Coast system, Texas Eastern Transmission Co.'s Big Inch.

Michigan-Wisconsin Gas Co.—185 miles, 4-14-in. laterals, Milwaukee-Fond du Lac, Sheboygan, and Green Bay, Wis., under construction; C. C. Griffis Construction Co., contractor; Paul Means, superintendent for Lake Del Mort crossing.

Montana-Dakota Utilities Co. and Montana-Wyoming Gas Pipe Line Co.—340 miles, 12¾-in., planned, Worland, Wyo., to Cabin Creek, Mont.; R. A. Conyes Construction Corp., contractor; Al Poggi, general superintendent; Chester Kincaid and Jimmy Alman, spreadmen.

Montana Power Co.—83 miles, 12¾-in., planned, Butte to Bozeman, Mont.; field office, Three Forks, Mont.; C. N. Deaton, spreadman.

New York State Natural Gas Corp.—53½ miles 16-in., loops, Pennsylvania.

Northeastern Gas Transmission Co.—511 miles, up to 20-in., planned, in New England area.

Northern Natural Gas Co.—41 miles, 20-in., under construction, Southwest from Garden City, Kans.; R. H. Fulton & Co., contractor.

597 miles of looping in 10 sections, contracted as follows: R. H. Fulton & Co., loops 1 to 5: loop 1, 40.2 miles, 26-in., extending northward from a point 28.7 miles north of Skellytown station in Pampa, Tex., area; loop 2, Beaver, Okla., station, 74.9 miles, 26-in.; loop 3, Mullinville, Kans., station, 33¼ miles, 26-in.; loop 4, Bushton, Kans., station, 72½ miles, 26-in.; loop 5, from a point west fo Garden City, Kans., to Bushton, Kans., station, 155 miles, 20-in. M. L. Boyd, spreadman; office, Perryton, Tex.; and N. A. Veach, spreadman; office, Liberal, Kans. Midwestern Constructors, Inc., loops 6 and 7; loop 6 from a point 29 miles northeast of Palmyra, Nebr., station, 43.4 miles, 26-in., to Oakland, Iowa, station; loop 7, from a point 17.8 miles northeast of Oakland, Iowa, station, 65.9 miles, 26-in. R. B. Potashnick, loops 8 to 10; loop 8, southwestward from Ventura, Iowa, station, 31.2 miles, 26-in.; loop 9, northward from Ventura station, 41 miles, 26-in.; loop 10, from the north end of a 26-mile gap beyond loop 9, where another loop will be built consisting of 39½ miles, 26-in.; total 111 miles, 24-in.; field office to be located at Ogden, Iowa, June 1; Boyd, spreadman.

Northwest Natural Gas Co.—750 miles planned; Washington, Oregon, and Idaho.

Pacific Gas & Electric Co.—506 miles 34-in., under construction, Topock, Ariz.-Milpitas, Calif.; Bechtel-Price-Conyes, contractor; main-line office, Barstow, Calif.; R. L. Bowman, general superintendent.

Panhandle Eastern Pipe Line Co.—356 miles, 26-in., authorized, looping in Texas, Oklahoma, Kansas, Missouri, Illinois, Indiana, Ohio, and Michigan.

Peoples Gas Light & Coke Co.—Planned 42 miles, 24-in., Joliet-Chicago, Ill.

Phillips Petroleum Co.—25 miles gathering system in West Edmond, Okla., field, under construction; Vaughn & Taylor Construction Co., Inc., contractor; spread office Edmond, Okla.

118 miles, 3-to-20-in., gas-gathering system in Sherman and Hansford counties, Texas, Vaughn & Taylor Construction Co., Inc., contractor; D. D. Vaughn, spreadman; field office, Texhoma, Okla.

Piedmont Natural Gas Corp.—1,350 miles, 20-in., planned, Greenville, Miss., to Norfolk, Va.

Plains Natural Gas Co.—78 miles, gathering system, Oklahoma-Kansas area, Hugoton field. Contracted by: Arey-Phillips Construction Co., Amarillo, Tex.; Tulsa Pipe Coating Co., Mid-Western Constructors, Inc., Engineering and supervision. Latter firm represented by Lyle DeWitt; field office, Liberal, Kans.

Roanoke Pipe Line Co.—30 miles 8-in., Gala, Va., to Roanoke, authorized.

South Jersey Gas Co.—77 miles, planned, Camden to Atlantic City.

Southern California Gas Co.—80 miles 30-in., Whitewater to Puente, Calif., planned.

Southern Natural Gas Co.—375 miles, 24-in., planned, Gwinville, Miss., to Atlanta.

225 miles, 16-in., planned, Colfax, Ga., extension.

110 miles, 11-in., considered; extension.

314 miles, 18-in., planned; extension.

171 miles, 16-in., planned; extension.

118 miles, 13-in., planned; extension.

Southern Union Gas Co.—78 miles, 8-10-14-in., planned, New Mexico loops and laterals.

Tennessee Gas Transmission Co.—65 miles, 16-in., planned, Ohio-Pittsburgh spur.

790 miles, 20-26-in., planned, Burnaugh, Ky., to Boston, including 400-mile line to Buffalo.

992 miles, 30-in., planned, first 150 miles of loops to be laid at Monroe, La., Greenville, Miss., Midland and Portland, Tenn.

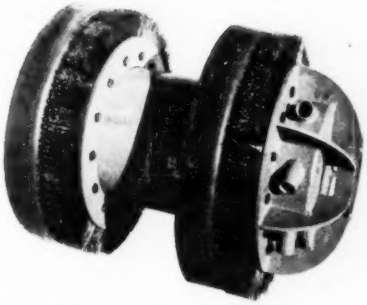
385 miles 26-in., Greenup County, Kentucky, to New York; contracted to H. C. Price Co., Bartlesville, Okla. Work to start in April.

Latex Construction Co. has following

Williamson Gas Line Pigs* Traverse 1½R 90° Bends

← 24" Size New Design TYPE GP PIGS with Brushes Mounted on Arched Springs to Compensate for Wear

30" Size → Standard Design TYPE RCN-50 with Jet Rotation Feature to Distribute Wear



*Patents Pending

Above Designs Available in 16" and Larger. Other Designs as Small as 2".

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contracts: 123 miles, 30-in., West Monroe to Many, La., W. H. Hayes, superintendent, field office, Jonesboro, La.; 54 miles, 16-in. and 12-in., Kinder to Grand Chenier, La., F. A. Silar, superintendent, headquarters, Kinder, La.; 95 miles, 30-in., Natchitoches to Kinder, La., F. A. Silar, superintendent, W. A. Briley, assistant.

54.2 miles, 30-in., under construction, White Bluff area to Joelton, Tenn., area, contracted to Morrison Construction Co.

36.1 miles, 30-in., under construction, Glasgow, Ky., area to Joelton area, contracted to Morrison Construction Co.

18.1 miles, 30-in., under construction Union City to Buckeye, Ky., Anderson Brothers Corp., contractors.

63 miles 26-in., Mahoning River near Youngstown, Ohio, southward; H. C. Price Co., contractor; G. A. Reutzel, supt.; field office, Columbiana, Ohio. 63 miles 26-in., Muskingum River northeastward; R. K. Shivel, supt.; office, Zanesville, Ohio; 47 miles 26-in., Muskingum River southwestward; W. B. Williams, supt.; office, McConnelsville, Ohio; 47 miles 26-in., Ohio River northeastward; C. R. Ice, supt.; office, Portsmouth, Ohio. (Balance of 373-mile Ohio River-Buffalo project to be started in August 1950.)

27.7 miles, 12-in., under construction, El Campo, Tex., to near Traitor, Tex.; Massey Construction Co., contractor.

25 miles, 30-in., Hardeman and McNairy counties, Tennessee; H. C. Price Co.; field office, Selmer, Tenn.; J. A. Reutzel, spreadman.

103 miles 30 and 26-in. loops, Premont to El Campo, Tex.; Oklahoma Contracting Corp., contractor; M. E. Shiflett, supt.; Joe Freeman, paymaster. Work under way.

70 miles, 26-30-in., between stations 104 and 110; Anderson Brothers Corp.; field office, Richmond, Ky.; E. C. McCoy and Arkie Hobson, spreadmen.

170 miles of 26 and 30-in., contracted by Anderson Brothers Corp., in Kentucky.

91 miles 30-in., Holly Springs, Miss., south; contracted to Oklahoma Contracting Corp.; Raymond Law, supt.; Gene Gohring, paymaster; office, Holly Springs; work to begin June 1.

Texas-Eastern Transmission Corp.—1,400 miles planned, Texas to Pittsburgh loops.

108 miles 16-in., authorized, Provident City to Baytown, Tex.

33 miles, 20-in., Hankamer to Beaumont, Tex.; Associated Pipe Line Construction, Inc., contractor; field office, Liberty, Tex.; C. E. Rogers, spreadman.

Texas Gas Transmission Corp.—103 miles, 20-in., Carthage, Tex., to near Lisbon, La., (Sharon); under construction; N. A. Saigh Co., Inc., contractor; Carthage, Tex.; Bob Floyd, representative. Construction subcontracted: (1) Fowler Brothers, 43 miles from Carthage to Red River, field office at Carthage; M. C. Johnson, spreadman; (2) 63 miles to Sharon station, Oklahoma Contracting Co. (J. R. Horrigan) field office at Minden, La.; Ed Flanagan, spreadman.

32 miles, planned, Slaughters, Ky., to Evansville, Ind.

Texas Illinois Natural Gas Pipeline Co.—1,400 miles, 30-in., planned, La Gloria field, Texas, to Joliet, Ill.

58-mile, 20-in. lateral, Joliet terminal to connection with Natural Gas Pipeline Co. of America near Volo, Ill.

Transcontinental Gas Pipe Line Co.—Texas-New York 1,840 miles, 30-in., main line and 500 miles, 4 to 22-in., gathering line. Section of 605 miles of 30-in. nearing completion.

Section 6, Newman, Ga., to Danielsville, Ga., 108 miles; Williams Brothers Co.; field office, Monroe, Ga.; Thelmer Davis, spreadman. Section 7, Danielsville, Ga., to Saluda River, South Carolina; 86 miles; Williams Brothers Co. Section 8, Saluda River, South Carolina, to Catawba River, North Carolina, 102 miles; R. H. Fulton & Co. Section 9, Catawba River, North Carolina, to North Carolina-Virginia boundary, 100 miles; Clark Williams, spreadman; field office, Spartanburg, S. C. R. H. Fulton & Co.; A. A. Corrigan, supt.; Clark Williams, general supt. Section 10, North Carolina-Virginia boundary to James River, Virginia, 86 miles; O. R. Smith Contracting Corp. Section 11, James River, Virginia, to Potomac River, Virginia; 110 miles; O. R. Smith Contracting Corp. Section 12, Potomac River, Virginia, to Susquehanna River, Pennsylvania, 76 miles; Associated Engineers & Contractors, Inc. Section 13, Susquehanna, Pennsylvania, to Delaware River, 90 miles; Wunderlich & Griffis Construction Co. Section 14, Delaware River to Hackensack River, New Jersey, 61 miles; Wunderlich & Griffis Construction Co. Section (unnumbered), Hackensack River, New Jersey, to Hudson River, New York, 23 miles; Oklahoma Contracting Co.; field office, Edgewater, N. J.; M. E. Shiflett, spreadman.

616 miles main and gathering lines west and south of Eunice, La. (361.1 miles is for main line and 255 miles for gathering lines.) Contracted as follows:

Schedule A.—Mercedes to south of Falfurrias, Tex., 80.1 miles 10 to 14-in. main line; Massey Pipe Line Construction Co., contractor; work to start in April or May.

Schedule B.—South of Falfurrias to Edna, Tex., 153.1 miles, 24 and 26-in. (H. B. Zachary Co., San Antonio, has contracted laying of 108 miles 24-in. in Schedule B.) Remaining 45 miles yet to be contracted. Work starts September 1.

Schedule C.—Edna to Porters, Tex., 114.9 miles, 26 and 30-in., to start in August. Contract to be announced.

Schedule D.—Porters to Sabine River, 91.5 miles, 30-in., contracted by Texas Southern Contracting Co., Fort Worth.; work to start in July.

Schedule E.—Sabine River to Eunice, La., 81.5 miles, 30-in., contracted by Anderson Brothers Corp., Houston; work starts in July.

Texas Unit I.—Gathering laterals to begin in May; El Campo, Tex., area, 58 miles

Crossing rocky swamp land in State of Maine

Associated's ability to construct pipe lines through most difficult terrain was selected to build a section of the 18" line to be laid through the States of New Hampshire and Vermont in 1950.

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PIPE LINE CONTRACTORS, INC.

(Formerly Associated Contractors & Engineers, Inc.)

A. L. Forbes, Jr., President — **Earl Allen, Vice-President**

P. O. Box 2163 — **Linden 7561**

HOUSTON, TEXAS

4 to 14-in., contracted to T & R Construction Co., Houston. Wharton, Tex., area, 98 miles, 6 to 14-in., contracted to Altgelt Construction Co.

Texas Unit II—Work to start in May; Sinton, Tex., area, 38 miles, 4 to 8-in., contracted to Shanks & Eustace, Inc., Alice, Tex.; Dix, Tex., area, 61 miles 6 to 10-in., contracted to Victoria Oil Field Maintenance Co., Victoria, Tex.

Schedule 7—86 miles of 30-in., Georgia, South Carolina, being started by Williams Brothers Corp. Spread under T. E. Davis; field office, Elberton, Ga.

Schedule 8—102 miles of 30-in., and Schedule 9, 100 miles 30-in., in South Carolina and southern Virginia, contracted to R. H. Fulton & Co.; operations under way in northern South Carolina; A. A. Corrigan, supt.; Clark Williams, general supt.

Schedule 10—86 miles of 30-in., and Schedule 11, 110 miles 30-in., contacted to Smith Contracting Corp.; work under way, R. M. Jones spreadman; field office, Altavista, Va.; to go east to meet spread to be put in field later under C. C. Craig; offices, Herndon, Va.; which will work west from Potomac River.

Schedule 15—24 miles of 30-in., northern end running to Hudson River, under construction; Oklahoma Contracting Corp.; M. E. Shiflett, spreadman; office, Edgewater, N. J.; Omaha Dredge & Dock Co., preparing laying of 30-in. across Hudson River in May.

85 miles, 4 to 14-in., gathering system, South Louisiana; J. B. Latham, superintendent; headquarters, Vinton, La.; Latex Construction Co., contractor.

50 miles, 18-20-in., gathering line, South Louisiana; O. R. Burden Construction Co., contractor.

Trunkline Gas Supply Co.—1,775 miles, 10-26-in., planned; includes 740-mile, 26-in. main line from Lake Charles, La., to Tuscola compressor station on Panhandle Eastern Pipe Line Co., and 1,035 miles, 10-24-in. Lake Charles, La., to McAllen, Tex., field lines, pending FPC approval of changed plans.

United Fuel Gas Co.—32 miles, 20-in. authorized; Roane, Calhoun, and Wetzel counties, West Virginia.

United Gas Pipe Line Co.—90 miles, 16-in., planned, West Bay field to New Orleans.

105.6 miles, 20-in., authorized, loop line paralleling Carthage, Tex.-Sterlington, La., and extending on to near Monroe, La.

26 miles in Louisiana conecting with East Texas system, planned.

United Natural Gas Co.—29 miles, 12-in., authorized, laterals, Elk County, Pennsylvania.

Virginia Natural Gas Co.—153 miles, planned, Buckingham to Richmond and Portsmouth, Va.

BOOKS

DICTIONARY OF BUSINESS TERMS—SPANISH-ENGLISH AND ENGLISH-SPANISH. By Louis A. Robb. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 217 pp. $4.

Material for this volume was gathered by the author while he was compiling terms for his Engineers' Dictionary. Since it was the desire to keep the earlier work devoted entirely to engineering terms, those not directly associated with engineering were not included. The new work is thus limited to works in the vocabulary of business.

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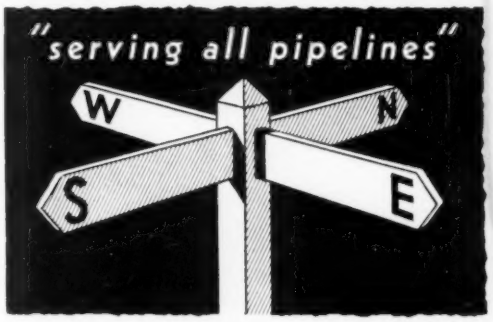

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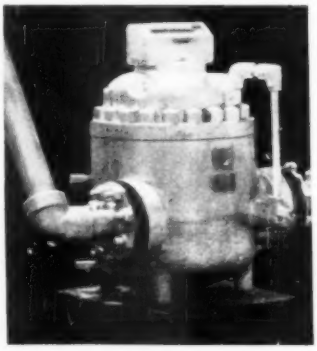

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NATURAL GAS

New Records Set

WILMINGTON, Del.—Texas Eastern Transmission Corp. reported last week that sales of natural gas through its pipe-line system increased in 1949 and rose to new high levels during the first quarter of 1950.

R. H. Hargrove, president, said gas deliveries to customers in nine states during the 3 months ended March 31 totaled 65.5 billion cubic feet compared with 40.9 billion cubic feet during the same period in 1949. March established new records in both volumes of gas delivered and in gross and net income, Hargrove said.

Gas Revenue Up

WASHINGTON. — Operating revenues of natural-gas companies reporting to the Federal Power Commission increased 13.6 per cent in January over the same month in 1949, FPC reported here last week. Revenues totaled $116,289,192 for the month, compared with $102,403,684 for same month a year ago.

Gas-utility operating income for the month totaled $24,849,544, up 9 per cent from the $22,787,833 reported for January 1949. Net income for the month was $21,621,985 compared with $19,477,985 in January 1949.

Sales to ultimate consumers in January 1950 were 176,177,000,000 cu. ft., an increase of 13.7 per cent over January 1949. Sales to residential consumers was up 10.2 per cent, and to commercial and industrial consumers, 8.2 per cent and 19.1 per cent, respectively.

Seek Ohio Gas Service

WASHINGTON.—A hearing opened last week before the Federal Power Commission on three Ohio gas companies competing for the right to sell natural gas in the northeastern section of their state.

The companies are Erie Gas Service Co., Inc., Lake Shore Pipeline Co., and Grand River Gas Transmission Co.

Tennessee Gas Transmission Co. proposes to deliver 17,000,000 cu. ft. of natural gas daily to whichever of the three firms is licensed by FPC to serve the area, which lies east of Cleveland.

To Spend $81,000,000

DALLAS.—D. A. Hulcy, president of Lone Star Gas Co., said here last week that his company estimated capital expenditures in the next 5 years, beginning with 1950, will approximate $81,000,000. The expenditures will be required to provide facilities to serve anticipated new customers to be added in that period, and for oil-exploration activities of the firm's subsidiary, Lone Star Producing Co.

The company during the past 12 months added 44,000 new natural-gas customers, increasing the total served to 512,000, Hulcy said. This is the greatest number ever added in any 12-month period.

"I see no letup in the requirements for natural-gas service this year, or in the years ahead," he added.

Rate-Increases Action

WASHINGTON.—Federal Power Commission has suspended two firms' proposed rate increases for natural gas and has ordered an investigation into rate charged by another company.

FPC suspended El Paso Natural Gas Co.'s proposed rate increase for wholesale natural-gas service to Southern California Gas Co. and Southern Counties Gas Co. of California, pending hearing and decision. No hearing date has been set. Also the commission suspended Northern Natural Gas Co.'s proposed wholesale natural-gas service rate increase, which amounts to $3,200,000 annually, or 14 per cent, pending hearing and decision. No hearing has been set for this proposal.

The commission has instituted an investigation into rates for gas sold by Southern Tier Gas Corp., Watertown, N. Y., to the town of Bath, N. Y., its only customer. The firm receives an average of 68.6 cents per 1,000 cu. ft. for gas sold to Bath Gas & Water System, which serves 1,500 customers. Complaints have been filed with FPC stating Bath is being charged excessive rates.

El Paso's rate increase, previously to become effective May 1, amounts to $2,465,000 annually, or 12 per cent.

Capacity Increase Sought

WASHINGTON.—Federal Power Commission has set hearings to begin here May 24 on Mississippi River Fuel Corp.'s proposal to increase daily sales capacity of its natural-gas transmission system from 266,000,000 to 375,000,000 cu. ft.

The commission also scheduled a prehearing conference for May 22 for the purpose of settling, simplifying, or limiting the issues to be considered at the public hearing.

Mississippi River Fuel is proposing to install and operate additional compressor units in Louisiana, Arkansas, and Missouri. Compressor units totaling 27,000 hp. would be installed in seven new stations, and additions totaling 5,000 hp. in two previously authorized stations, plus three 12-in. river crossings and about 4½ miles of 24-in. loop line.

Virginia Gas Proposal

WASHINGTON.—A hearing will be held here before the Federal Power Commission May 10 on application of Virginia Gas Transmission Corp. for authorization to construct and operate a measuring and regulating station for the delivery of natural gas to Virginia Gas Distribution Corp. for resale to the Strasburg, Va., Lime Co.

Natural Gasoline

Plant Dedicated

Levelland facilities now in full operation

LEVELLAND, Tex.—The Levelland gasoline plant, operated by Stanolind Oil & Gas Co. as a gas-conservation project, was formally opened last week in dedication ceremonies held at the plant site. Principal speaker was William J. Murray, Jr., chairman of the Texas Railroad Commission, who expressed alarm over trends which he said might make it economically impossible to carry out future gas-conservation programs.

The plant will extract butane, propane, and natural gasoline from the casing-head gas which it will process. It has a design capacity of 40,000,000 cu. ft. daily and a recovery of 130,000 gal. each 24 hours. This includes 60,000 gal. of natural gasoline, 40,000 gal. of butane, and 30,000 gal. of propane.

Murray termed the plant an industrial monument to the success of the American system, and said that such conservation projects are of immense importance.

"Trends are present which could again render it not economically feasible to construct additional gas-conservation plants, and possibly make it economically impossible to continue the operations of plants already in operation," Murray said. "These trends are in the guise of movements to protect the consumer, but when a real factual analysis is applied to them, one sees how gravely the ultimate security of the consumer is impaired."

Stanolind operates the plant for the 11 participating owners. The other owners include: The Texas Co., Magnolia Petroleum Co., Mid-Continent Petroleum Corp., Tide Water Associated Oil Co., Superior Oil Co., Sun Oil Co., Kewanee Oil Co., Skelly Oil Co., Maracaibo Oil Exploration Corp., and Cobb & Watson.

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Among the Drilling Contractors

Big Chief Western Adds 5 Rigs With Aztec Deal

Recent acquisition of Aztec Drilling Co. of New Mexico has provided Big Chief Western Drilling Corp., Shreveport, with five additional rigs and substantially broadened its scope of activity. Taking over Aztec operations, the company currently is active in four states, including Wyoming, New Mexico, Kentucky and Mississippi. In addition to the five rigs, the company obtained a considerable amount of other drilling tools and equipment in the purchase.

Big Chief Western Drilling Corp. is headed by William T. Payne, also president of Big Chief Drilling Co., Oklahoma City. Other officers include: H. L. Rowley, Shreveport, vice president and treasurer; W. M. Vaughey, Jackson, Miss., vice president; R. M. Hurt, Denver, secretary, and district representative, Rocky Mountain area. Hurt will be in charge of properties acquired from Aztec.

Contractor Conferences Set to Start on May 15

Starting date for the second annual series of management institutes sponsored by the American Association of Oilwell Drilling Contractors has been set tentatively as May 15 with registration to close May 5. The conferences, to be held on two consecutive days in each of 15 places in the country, will continue through May and June.

Among problems of management and key personnel in the drilling industry to be discussed are: Clarification of bid requests, clarification of contract terms, establishment of an understanding of each party's responsibilities, maintenance of harmonious relationships at field level between operating company's and drilling contractor's personnel.

C. W. DeLancey, Houston, who, before his retirement in 1949, was manager, Gulf Coast division, Humble Oil & Refining Co., will lead the institutes on the subject of "Drilling Contractor—Oil Company Relationships."

Brinkerhoff Drilling Co., Dallas and Casper, has been awarded the contract for a 9,500-ft. test which J. H. Snowden and associates have projected in Lynn County, West Texas. The test, 1 Williams, a wildcat, is located in Section 1407, ELRR Survey, ½-mile west of the Garza County line.

Bell & Burden, Inc., Los Angeles, has four rigs working for Continental Oil Co. in the San Miguelito field, Ventura County, California. Testing still is under way at 65-E Grubb, which was carried to a total depth of 16,727 ft. to establish a new depth record for Ventura County.

Gulf Coast Drilling Co., Houston, is drilling for Lynn Oil Co. at 1 Devill, a 6,000-ft. test in the Big Island field, Rapides Parish, coastal Louisiana. Location is in 2-4n-3e.

Arthur Willingham, Ardmore, Okla., has been awarded the contract for a well which Keystone Oil Co. will drill on the northwest side of the 4-well Ardmore pool, Carter County, Oklahoma. The well will be 1 Russell, NE SE 14-5s-1e.

H. L. Whiston is the contractor on a wildcat test being started by Hollister Oil Development Co. in the Hollister area, San Benito County, California. The test is 1 Dooling, in 12-12s-5e.

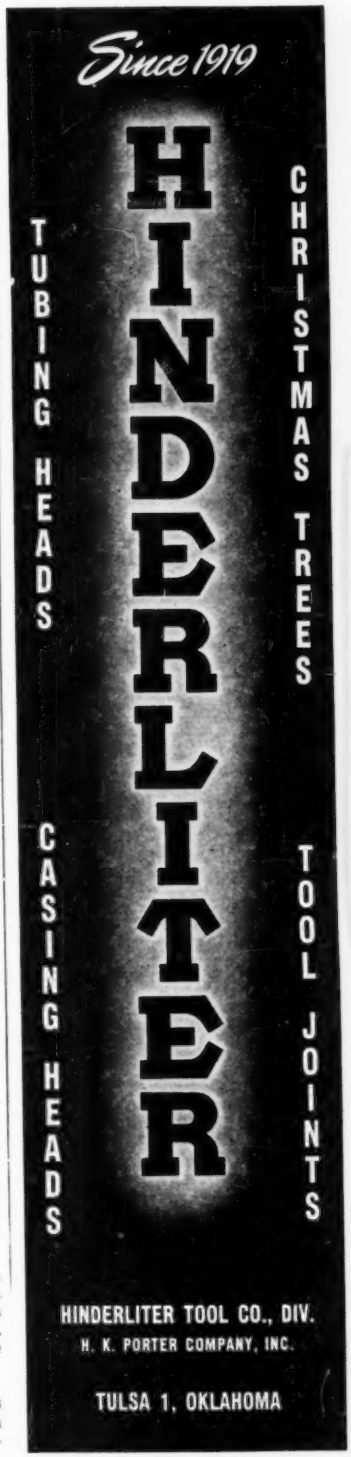
Irving Hupp is the contractor on a Madison lime exploratory test being drilled for K. B. Frazier and associates at an outpost location east of the Bear's Den area, Liberty County, Montana. Location is in 4-36n-6e. Cable tools are being used.

Britain - Corbitt Drilling Co., Inc., Oklahoma City, is starting another well for Ashland Oil & Refining Co. in the Southwest Antioch field, Garvin County, Oklahoma. It is 1 Goings-Vaughn, NW SW NW 2-3n-3w.

Curtis Singleton Drilling Co., Corpus Christi, has a wildcat test of its own under way in the William Griffin Survey, 16 miles south of George West, Live Oak County, South Texas. Projected depth is 6,100 ft. Location for the test, 1 Hinnant, is about 3 miles northwest of the Hinnant field.

Canada West Drilling Co., Calgary, is moving a rig to the Hannah area, 95 miles northeast of Calgary, South Central Alberta Province, Canada, where it will drill for E. G. Lawrence and associates.

Fleet Drilling Co., Ada, Okla., has moved a rig to an outpost location northeast of the Byars pool, Potta-



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watomie County, Oklahoma, where it will drill for Van-Grisso Oil Co. and Easton Oil Co. at 1 Ball, NW NW NE 8-5n-3e.

Loffland Brothers Co., Tulsa, has the contract for a projected 10,000-ft. Dakota sand test to be drilled for L. H. Pearson and associates of Casper at North Brenning, Converse County, Wyoming.

Nicklos Drilling Co., Houston, is starting another 11,000-ft. well for Gulf Refining Co. in the Krotz Springs field, St. Landry Parish, Louisiana Gulf Coast. It is 2-B Harriet Mertz, 23-6s-7e.

H. & H. Drilling Co., Wichita, has a rig running for W. L. Hartman at a wildcat location 5 miles west of Great Bend, Barton County, Kansas. The test, 1 Glazner, is in 32-19-14, and is 3 miles from any other production.

R. C. Patton Co., Wichita, has taken a contract to drill a wildcat test in southwestern Harper County, Kansas, for **Falcon-Seaboard Drilling Co.**, Tulsa. Location is on the latter company's Schupbaugh lease, in 6-34-9, which was obtained on a farmout from Atlantic Refining Co.

Number of Active Rigs Sets New 1950 Record

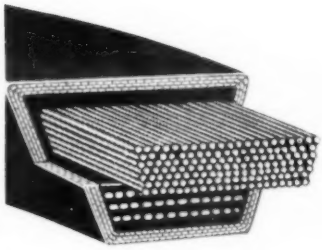
Rotary drilling rigs operating in the United States and western Canada during the week ended April 24 totaled 2,121, the greatest number reported at any time so far this year. The greatest number previously reported was during the week ended January 2, when 2,112 rigs were running. The total was 58 greater than the number operating the previous week, but lacked 46 of equaling the number running a year ago.

Reflected in the increase was a substantial pick-up in drilling activity in the Illinois basin region where 118 rigs were reported running during the week ended April 24 as compared with 91 during the previous week. Increases, however, were indicated in all areas except Oklahoma, the Pacific Coast and western Canada.

ROTARY RIGS IN OPERATION*

Area	Week ended 4-24-50	Change week ended 4-17-50	Change week ended 4-25-49
Gulf Coast	501	+ 2	60
W. Tex.-N. M.	720	— 2	+ 151
Ark.-N. La.-E. Tex.	136	+ 10	3
Oklahoma	257	— 4	— 9
Kansas	132	+ 12	+ 13
Illinois-Eastern	118	+ 27	5
Rocky Mountains	71	+ 8	— 32
Pacific Coast	123	8	— 80
Total U. S.	2,058	+ 58	25
Western Canada	63	0	21
Total	2,121	+ 58	— 46

Courtesy Hughes Tool Co.



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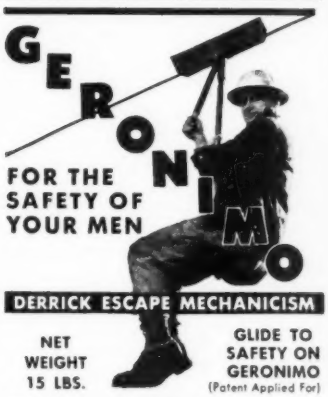

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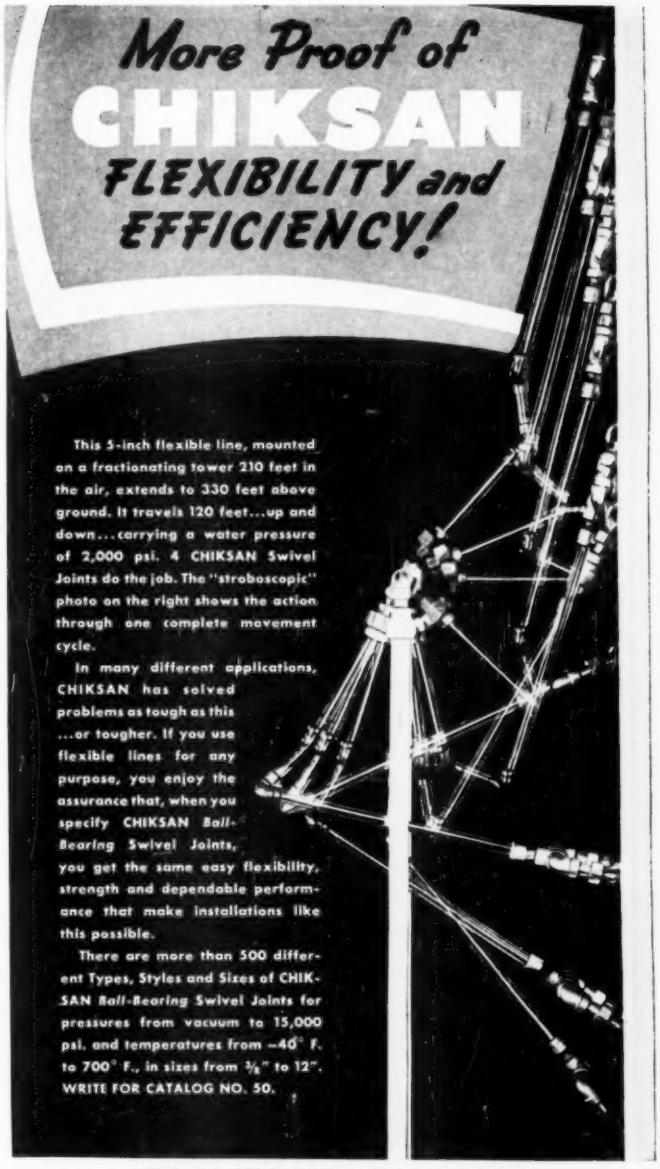

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The location of this flexible line, at the top of the fractionating tower, demands dependable performance with minimum maintenance attention. CHIKSAN *Ball-Bearing* Swivel Joints meet these requirements fully.

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Exploration Men Are Optimistic

AT least one of the outstanding impressions of the exploration scientists convention at Chicago last week was the general air of confident optimism displayed by practically all those present. It wasn't complacency, or smug satisfaction. It was the confidence of men who had been through some rough experiences, faced tough problems, often with inadequate manpower, but had come through with flying colors. They had learned much, they knew they had a lot more to learn, but they were confident they could do whatever was necessary in the future. After all, they had found enough oil to fuel a world war, and then had found enough to end an unexpected postwar oil shortage.

Many of the older men are gradually stepping aside, or shouldering less responsibility. They are more than satisfied with the caliber of the younger men who have been developing and are now stepping in to carry on.

The most tangible evidence of the optimism about the future is the general theme that runs through the various geographic committee reports on what will ultimately be the revised edition of "Possible Future Oil Provinces of North America." The first version, published 9 years ago, ran only 154 pages in length, and there was a great deal of conservatism in what the geologists would say about many areas as to future possibilities.

The new version, when completed, will run well over 500 pages in length; it will contain many more maps and cross-sections. Furthermore, it will reflect much more optimism about a great many more areas. About all a geologist asks now is a reasonable thickness of sediments, with a reasonable proportion of marine sediments. In fact, as one geologist put it—about the only places they rule out now are those where they are sure there is solid granite. If the granite is weathered, they are inclined to give it a sporting chance.

Of course reef talk was just about as prevalent as expected. In other words, everybody is interested in reefs. The new bibliography, mentioned in this column last week, received a warm welcome and a resolution of thanks from the A.A.P.G.

The geophysicists were almost as excited about the prospects of a new instrument that mechanizes a great deal of the seismograph computing work. Briefly, here are the claims for it. "With only visual adjustments and alignments, the 'computograph' applies previously determined time corrections to reflection time picks on seismograms, and by manipulation of a mechanical linkage, the depth points corresponding to these corrected times are set up for plotting vertically beneath the midpoint between shot point and receptor station.

"Twenty separate time-depth relationships for two predetermined shooting distances are set into the machine easily and quickly. An ingenious mechanism employs these settings to establish a wave front over a slotted template whereby the depth point is positioned and plotted."

For the laymen, it seems that this is a specially designed calculating machine that does for a seismograph computer in his special problems, what an ordinary calculating machine does for most of us when we have some multiplying or dividing to do. It is going to cost quite a chunk of money, but if it lives up to its claims, a lot of companies may decide it's worth the price. We'll probably have a feature story, with all the details in The Oil and Gas Journal in about a month to 6 weeks.

If some of the material in the symposium on trapping components is any indication, there is a growing interest in the problem of what distinguishes major oil accumulations from small ones.

The trend toward closer and closer cooperation between geologists and geophysicists is continuing full speed. Some of the companies are revising their organizational setup to assure this; others are inaugurating general policies and specific instructions that are aimed at the same results.

There are a host of problems facing the exploration scientists, in both geological and geophysical fields. They are recognized and many of the more important are being subjected to coordinated mass attack. Even if no perfect solution to such problems is found, every one is confident of making substantial progress aimed at least at diminishing their economic effect on costs.

Charles J. Deegan.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

TEXAS GULF COAST.—Kountze field of Hardin County has been extended by General Crude Oil Co. and Sohio Oil Co. 1 Esther Hooks, J. D. Knight Survey. Abstract 353. The well flowed 120 bbl. of 35°-gravity oil daily through perforations at 8,252-46 ft.

WEST TEXAS.—Barnsdall Oil Co. 1 Spires, NE SW 22-4-H&GN, plugged back from Ellenburger, which had water at 7,564 ft., set casing at 6,864 ft., acidized and flowed at the rate of 6 bbl. of oil an hour for 20 minutes, and was shut in for storage. Casing perforations were from 6,755-71 ft., tubing run to 6,781 ft. with packer at 6,671 ft., 1,500 gal. of acid spotted, and the well was shut in for 47 minutes. When opened, it kicked off and flowed through 10/64-in. choke. On elevation of 2,145 ft., the Pennsylvanian was topped at 6,760 ft. Location is 8¾ miles southwest of Claremont, about 5 miles northwest of Cogdell field production and nearly 2 miles south of the Mountain Fork Brazos River.

ROCKY MOUNTAIN AREA.—British-American Oil Producing Co. is continuing to test in the Lakota sand, with the zone making oil and water, at its northeastern Colorado wildcat. In the East Rifle Creek area, Colorado, Milo B. Siegel et al., have temporarily plugged their wildcat after the well failed to produce from Weber sand. Bay Petroleum Corp. et al., are logging shows of gas in the Frontier formation at their Wallace Creek, Natrona County, Wyoming, wildcat.

KANSAS

Forest City Basin Gets Second Viola Discovery

VIOLA lime is showing for good production in a second pool in the Forest City basin, in the northeastern part of the state. This is in the Strahn pool, northern Nemaha County, where Carter Oil Co. found saturation in the above pay zone at its 2 Strahn, NE SW NW 27-2-14e.

The deeper prospective pay zone was topped at 3,559 ft. (—2,247 ft.) and was cored and drilled to 3,577 ft. Three drill-stem tests, each lasting 2 hours, were made. The first, taking in an interval at 3,560-67 ft., got only mud. The second, at 3,566-72 ft., resulted in a recovery of 2,192 ft. of clean oil. The third, at 3,572-77 ft., yielded 2,939 ft. of oil and 5 ft. of mud. Following the tests, oil string (5-in.) was run to 3,562 ft.

So far, the discovery producer, although completed in October 1948, has been the only well for the pool. Its pay zone is the Hunton lime, from which, currently, only a small amount of oil is being pumped. The new well, a location from the first, found only small shows in that zone.

First Viola production for this basin was found in the Davis Ranch pool, Wabaunsee County, about 75 to 80 miles southwest of the Strahn pool. That pool, opened a little more than a year ago, now has more than 20 producing wells, most of them completed with maximum potentials. So far, Viola lime is the only productive horizon for that pool.

Stanolind Oil & Gas Co. and Winkler-Koch Engineering Co. have completed their 1 Cornwell, NE NE NE 26-16-10e, northwestern Lyon County, as the initial well of the Bushong pool, another Forest City basin discovery. This well, producing from the Hunton lime, topped at 2,950 ft. (—1,603 ft.) and open to 2,967 ft., pumped 257 bbl. of net oil with about 20 per cent of the total fluid being water. The new pool is 17 miles south of the Davis Ranch pool.

Ray Anderson and associates 1 Ball, SW SW NW 23-18-10e, which opens another pool about 11½ miles south of the Bushong pool, in the same county, is pumping 16 bbl. of oil and 38 bbl. of water daily with production from Kansas City lime, open at 1,590-1,612 ft.

Lewis Drilling Co. has a prospective discovery well at its 1 Dietz, SW SW NW 9-17-14, 2 miles north of the Carroll pool, nearest production, Barton County. In a drill-stem test at 3,230-50 ft. in the Lansing, topped at 3,223 ft. (—1,244 ft.), operators recovered 150 ft. of clean oil with an additional 75 ft. of oil-cut mud. Deepened, the well also found good oil and gas showings in the Arbuckle, topped at 3,494 ft. (—1,515 ft.). Rotary hole was carried 4 ft. into the Arbuckle and casing run to the top.

In the southeastern part of the same county, Henderson Oil Co. 1 Jordon, SW SW SE 8-18-11, swabbed 3 bbl. of oil per hour while testing Arbuckle lime at 3,368-81 ft. (—1,549-62 ft.). Formation received a 750-gal. acid treatment. Location is about 2 miles northwest of the Northwest Ames pool.

Petroleum, Inc., 1-B Keller, SE NE SW 29-21-13, a mile southeast of the Pundsack pool and about the same distance southwest of the South Hazel pool, northern Stafford County, appears to be opening another new area. With casing perforated at 3,748-50 ft. in Arbuckle lime, logged at 3,744-82 ft. (—1,836-74 ft.), and pay acidized with 250 gal., the well made 6 bbl. of oil per hour in a 6-hour swabbing test. Testing continues.

Reserve Drilling Co. has an exceptionally good well in the Northampton area, southwestern Rooks County. Its 1 Kern, NW NW SW 28-9-20, located north of the Palco pool, filled 3,000 ft. of oil in the first hour after drilling plug to test Arbuckle at 3,855-59 ft. (—1,578-82 ft.). Swabbing from 1,700 ft. off bottom, it made 50 bbl. in the first hour.

KANSAS WILDCAT FAILURES

Barton County: Brack Oil Co., Inc., 1 McMullen, SE SE SE 27-18s-14w, dry, TD 3,555 ft., anhydrite 840 ft., lime 3,205 ft., Lansing 3,220 ft., conglomerate 3,434 ft., Arbuckle 3,522 ft.

Ellsworth County: B & R Drilling Co. 1 Kuck, SW SW NE 8-14s-10w, dry, TD 3,452 ft., Topeka 2,516 ft., Heebner 2,807 ft., Dodge 2,854 ft., Lansing 2,900 ft., Kansas City 3,194 ft., Marmaton 3,203 ft., conglomerate 3,280 ft., Arbuckle 3,415 ft., and 3,428 ft.

Derby Drilling Co. et al., 1 Sturn, NW SW NW 31-17s-9w, dry, TD 3,260 ft. in Arbuckle, anhydrite 575 ft., Heebner 2,835 ft., Lansing 2,962 ft.

Pratt County: Rine Drilling Co. et al., 1 Buckner, NE SE NW 9-28s-13w, dry, TD 4,551 ft., Douglas 3,663 ft., Lansing 3,789 ft., Kansas City 4,161 ft., Mississippian 4,194 ft., Viola 4,261 ft., Simpson 4,407 ft., sand 4,418 ft., Arbuckle 4,510 ft.

Rice County: Don Ingling 1 Habiger, SE SE NW 18-18s-9w, dry, TD 3,233 ft.

Rooks County: Harbar Drilling Co. 1 Sparks, NW SE SW 34-9s-19w, dry, TD 3,659 ft., Lansing 3,383 ft., conglomerate 3,619 ft.

Sedgwick County: Ecklund Drilling Co. 1 Homer Smith, C S 2 SE SE 13-17s-2e, dry, TD 2,486 ft., Kansas City 2,372 ft.

Woodson County: Barentz & Eades 1 Eades, SE SE SW 7-25s-15e, dry, TD 1,550 ft., Mississippian 1,515 ft.

TEXAS GULF COAST

Kountze Field Is Extended

HOUSTON—General Crude Oil Co. and Sohio Oil Co. are extending Kountze field, Hardin County, with completion of the 1 Esther Hooks, J. D. Knight Survey, Abstract 353. On test, the well flowed 120 bbl. of 35 -gravity oil daily through a ⅛-in. choke. The well is bottomed at 8,512 ft., and is flowing through perforations at 8,252-46 ft. Tubing pressure on the test was 1,700 psi.

G. S. Hammonds has completed a small discovery approximately 10 miles southwest of Cold Springs, San Jacinto County. The operator's 1 Sue Hill reported a flow of 16 bbl. of oil daily from an unreported level. The hole is bottomed at 4,396 ft. with 5½-in. casing set to 4,386 ft. Location is in the Vital Flores League, Abstract 14.

Henderson Coquat and Stanolind Oil & Gas Co. are coring ahead for the Luling sand at 7,345 ft. after testing oil in the 1 Mrs. Clara Briam, Live Oak County wildcat. Operators cored the Slick sand from 7,256-66 ft. which had oil odor. A drill-stem test was run at this level, using a ⅜-in. bottom and ¼-in. top chokes. In 30 minutes, there was a small steady blow and the well recovered 60 ft. of pipe line oil, 30 ft. of oil-cut mud, and developed a working pressure of 500 psi. This wildcat is located in the Dennis McGowen Survey, Abstract 29.

In the Smith's Point area of Chambers County, Sun Oil Co. has run electric log to 10,000 ft. in the 1 Brandt, Henry Barker Survey, 2 miles west-southwest of South Mayes field. Operator is preparing to drill ahead toward the 12,500-ft. proposed depth.

Also in Chambers County, Sun is fishing in its D-3 White estate, outpost in Sea-breeze area, T&NO Survey 132. Total depth is 8,886 ft. in sidetracked hole.

TEXAS GULF COAST (DISTRICTS 2 & 3) WILDCAT FAILURES

Bee County: E. W. Gill and Texita Oil Co. 1 W. E. Kubala, George O'Dockarty Sur., 1¾ mi. SE Youngeen field, dry, TD 4,510 ft.

De Witt County: American Republics Corp. et al., 1 H. Heaton heirs, Manuel Manchaca Sur., 7 mi. NE Thomaston, dry, TD 8,515 ft.

Montgomery County: Humble Oil & Refining Co. 1 S. S. McClendon, Jr., et al., James Pevehouse Sur., A-29, 4 mi. SW Conroe, dry, TD 8,500 ft.

C. N. Housh 1 A. E. Whitmire, M. B. Lawrence Sur., 3 mi. S Fostoria, dry, TD 5,800 ft.

Refugio County: Cox & Hamon 1 C. H. Shaw, Johnson & Pugh Subd. of T. D. Wood Ranch, dry, TD 6,910 ft.

Walker County: L. M. York 1 Anna Surgi, C. A. Sleight Sur., 2 mi. NW New Waverly, dry, TD 3,426 ft.

Wharton County: Smith & Smith and J. B. Ferguson 1 J. B. Gary est., G. E. Edwards Sur., 1 mi. E Magnet townsite, dry, TD 7,520 ft.

SOUTHWEST TEXAS

Nueces County Prospect Cores Ahead After Tests

CORPUS CHRISTI—The Chicago Corp., Sullivan, and Garnett are coring ahead at 7,277 ft. in the 1 Jonas Weil, J. H. Gallagher Survey, Abstract 986, Nueces County, after recovering pipe-line oil on two drill-stem tests. On test run from 7,249-51 ft., the well recovered 1,830 ft. of oil and 150 ft. of salt water. Another test run from 7,251-57 ft., recovered 990 ft. of oil and 90 ft. of salt water. This potential new field opener is located approximately 2 miles northeast of Baldwin field.

Eight miles south of Pharr, Hidalgo County, Taylor Refining Co. and Mayfair Minerals, Inc., are at a total depth of 11,618 ft. in the 1 B. F. M. Klump. Operators perforated from 11,565-11,600 ft., but the test was unsuccessful. They have now reperforated at 11,420-50 ft. and are preparing to test.

The second gas producer has been completed, confirming production in a new Zapata County field. J. C. McCabe has run an open flow gage on the 2 Cuellar heirs, which flowed 3,580,000 cu. ft. of gas daily through perforations at 1,122-50 ft. The new well is located 1,320 ft. southwest of the 1 Cuellar heirs, TCRR Survey 245.

Ryan, Hays & Burke, have run a drill-stem test from 5,686-91 ft. in the 1 George T. Jambers, James Freal Survey 155, Abstract 189. On a 20-minute test, the well recovered 30 ft. of rat-hole mud through a ¼-in. choke with no bottom-hole flowing pressure.

London Gin field of Nueces County has extended to the southwest at Atlantic Refining Co. 1 P. C. Calloway. The well flowed 88 bbl. of 32 -gravity oil daily on potential test through a 10/64-in. choke. Tubing pressure was 120 psi. The well is bottomed at 4,524 ft. and is producing through perforations at 4,495-4,503 ft. Located in SW¼ Section 12, Laureles Farm Tracts, the well is 1,000 ft. southwest of Atlantic's 3 Ollie London, former field extender.

SOUTHWEST TEXAS (DISTRICTS 1 & 4) WILDCAT FAILURES

Atascosa County: V. G. Schimmel 1 Sam Fowler, G. W. Mett Sur. 386, 7 mi. SW Somerset, dry, TD 1,807 ft.

Brooks County: Henshaw Bros. & O. R. Mitchell 1 R. A. Myrick, Roxie Rorex Sur. 426, A-470, 1 mi. S Alta Verde dome, dry, TD 4,944 ft.

D. J. Moss 2 Mrs. R. A. Myrick, Sur. 312, Cert. 151, 23 mi. W Falfurrias, dry, TD 2,497 ft.

Kinney County: J. R. Johnson Drilling & Supply Co. 1 Joe York, I&GN Sur. 556, Block 19, dry, TD 3,000 ft.

Nueces County: Curtis Singleton Drilling Co. 1 Sam and George Taylor, Blk. 7, Sec. 1, Roberts & White Subd., 8 mi. SW Robstown, dry, TD 6,355 ft.

Webb County: O. W. Killam 2 Marshall Bros., Sur. 674, Blk. 5, 9 mi. N Bruni, dry, TD 2,453 ft.

O. W. Killam 2 Marshall Bros., Sur. 674, Blk. 27, 9 mi. N Bruni, dry, TD 2,207 ft.

ROCKY MOUNTAIN

Logan County, Colorado, Has Good Prospect

DENVER—Continued testing in the British-American Oil Producing Co. and Plains Exploration Co. wildcat in the Armstrong area, Logan County, Colorado, is believed to indicate a commercial producer in that area. The operator perforated 7-in. casing opposite Lakota sand between 5,623½-43½ ft. and is now swabbing oil and water from that formation. Top of the Lakota sand was logged at 5,606 ft. and the present zone is the second sand in that formation. The well is 1 Segelke, NE NW NE 26-11n-53w, north of the town of Sterling, and is the first to be drilled by British-American et al., on an extensive lease spread throughout Logan County. The operator is reported swabbing at the rate of 15-20 bbl. of fluid per hour and testing will continue in the hope that the water percentage will diminish. The wildcat was drilled into the Morrison at 5,830 ft., total depth, and casing cemented on bottom. This well made gas on drill-stem tests in the Muddy sand, with tests totaling more than 10,000,000 cu. ft. daily. In the Dakota sand topped at 5,406 ft., the well tested light, paraffin-base oil, with water in the base of the sand. The oil recovered on drill-stem test in the Lakota sand was 17.1° gravity, with some water, and it is this zone that is now being retested. Meanwhile, continuing the exploratory drilling program, Plains Exploration Co. of Denver, with contributions from British-American and others has made location for 1 Stratton, SE SE SE 18-11n-50w, in the North Proctor area, 14 miles east of the British-American wildcat. E. K. Carey Drilling Co. is preparing to spud on the wildcat. British-American also plans additional drilling in the area, upon completion of the North Proctor wildcat.

There was no recovery on tests following acid and paraffin treatment in the Weber in the Milo B. Siegel et al., wildcat at 1 Bowen, Lot 3, Section 3-5s-92w, in the East Rifle Creek area, Garfield County, Colorado. The operator found shows of oil in that formation when it was drilled but casing was cemented on top of the sand at 895 ft., and the hole was bailed dry with no fill-up. The well was drilled to 1,059 ft., total depth, and the show was encountered between 900-75 ft. on electric log. The operator has temporarily abandoned the test. The well is located on a farmout from Phillips Petroleum Co.

Bay Petroleum Corp. et al., have had shows of gas in the Frontier at their wildcat at 1 Unit, SE SW NE 15-34n-87w, a wildcat in the Wallace Creek area, Natrona County, Wyoming. Top of Frontier formation was logged at approximately 9,180 ft., and the operator is now coring and drilling below 9,365 ft. At this depth no complete Frontier sand body has been encountered, but as many as three Frontier sands are considered probable in this area of the Wind River basin. There has been no previous deep drilling on the Wallace Creek structure, and the well is located on a block farmed-out from Superior Oil Co. following seismic work in the area. This structure is west of Pure Oil Co.'s West Poison Spider field, where production is from Frontier sand at around 14,000 ft. The present Wallace Creek well is planned as a Lakota sand test to around 10,500 ft.

WYOMING SUCCESSFUL WILDCAT

Converse County, Glenrock area: Phillips Petroleum Co. 1 Brubaker, SW SW SW 33-34n-75w, TD 7,188 ft., PB 7,086 ft., 7-in. casing at 7,048 ft., with 500 sacks, elev. 4,967 ft., gr., Mesaverde 1,804 ft., Parkman 2,215 ft., Steele 2,700 ft., Niobrara 5,245 ft., first Wall Creek 5,869 ft., no Muddy, Dakota 7,048 ft., sand (Lakota ?) 7,138 ft., pumped 162 bbl. oil and 69 bbl. water per day from Dakota.

COLORADO WILDCAT FAILURE

Phillips County, Holyoke: C. E. Stout 1 Fiedler, CE½ SW SW 17-6n-46w, dry, TD 4,063 ft., Niobrara 2,724 ft., Timpas 3,130 ft., Greenhorn 3,323 ft., first sand (Greasewood) 3,521 ft., second sand (Muddy) 3,628 ft., third sand (Dakota) 3,813 ft., Morrison 4,004 ft.

IDAHO WILDCAT FAILURE

Owyhee County, Indian Cove area: Helmerich & Payne 2 State, SW SW SW 16-7s-9e, TD 2,068 ft., dry, basalt 1,970-80 ft.

SOUTH LOUISIANA

Farthest and Deepest Pay Found in Gulf of Mexico

NEW ORLEANS—Twenty-five miles off the St. Mary Parish coastline, Magnolia Petroleum Co. has completed the A-1 State Lease 694, oil discovery which extends production so far to its farthest point in the Gulf of Mexico. The well flowed 614 bbl. of 34.4°-gravity oil daily through 12/64-in. choke with a flowing pressure on the tubing of 2,565 psi. This is also the deepest producer in the Gulf, flowing through perforations at 11,648-58 ft.

J. P. Petkas and associates have abandoned the 1 Leonard K. Nicholson, 112-6s-9e, Pointe Coupee Parish wildcat, at 11,097 ft. The well cored shows in the Frio between 8,678-9,480 ft., and more recent tests in the Cockfield showed some oil in top sections, but water was predominantly present.

Approximately 3 miles northeast of Opelousas townsite, 41-6s-4e, St. Landry Parish, Magnolia is coring below 13,326 ft. in the 1 Alice B. Rozas. Operator will probably core the well continuously to projected depth of 14,000 ft.

The Texas Co. is drilling below 10,850 ft. in the 1 Mrs. Edith W. Donner et al., 4-13s-3w, Cameron Parish wildcat. The well was originally projected to 10,000 ft., but operator decided to drill ahead after it kicked while drilling at 10,257 ft. and flowed gas and salt water.

Shell Oil Co. has moved approximately 3,000 ft. southwest from its 1 State Lease 1,008, South Pass area wildcat off Plaquemines Parish. The new well is projected to 10,000 ft. Meanwhile, the company's 1 State Lease 1,008 is shut in awaiting completion. It is bottomed at 12,128 ft., and on drill-stem test at 6,530-34 ft., flowed 189 bbl. of 22.2°-gravity oil daily through ⅛-in. choke.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Acadia Parish: Atlantic Refining Co. 1 Pearl R. Cowen, 18-10s-1w, 1½ mi. SE of Midland prospect, TD 11,358 ft., perf. sand 10,994-11,004 ft., 29 bbl. of condensate per day, 10/64-in. choke, TP 2,900 psi., 49.5° gravity.

St. Mary Parish: Magnolia Petroleum Co. A-1 State Lease 694, Block 125, 25 mi. offshore, TD 11,672 ft., perf. sand 11,648-58 ft., 614 bbl. of oil per day, 12/64-in. choke, TP 2,565 psi., 34.4° gravity.

SOUTH LOUISIANA WILDCAT FAILURES

Lafayette Parish: Humble Oil & Refining Co. 1 Alex Hernandez, 4-9s-4e, 2 mi. SE Carencro, dry, TD 10,585 ft.

Pointe Coupee Parish: J. P. Petkas et al., 1 Leonard K. Nicholson, 12-6s-8e, 4 mi. S-SE Livonia, dry, TD 11,097 ft.

St. Charles Parish: Ginther, Warren & Ginther 1 F. E. Martinez, 30-11s-9e, Lake Front area, dry, TD 10,015 ft.

St. Landry Parish: Humble Oil & Refining Co. 1 Mrs. Dora Jagneaux, 8-6s-3e, Lawtelle area, 6 mi. W of Opelousas, dry, TD 11,507 ft.

St. Martin Parish: K. B. Knox 1 Marcelin Francois, 8-10s-7e, NE St. Martinville prospect, dry, TD 3,300 ft.

Terrebonne Parish: Humble Oil & Refining Co. A-1 State Lease 929, Block 16, S Pelto area, offshore, dry, TD 13,211 ft.

Vermilion Parish: Sohio Petroleum Co. 1 W. Bagrera-Liberty Farms, 2-14s-2e, dry, TD 11,833 ft.

OKLAHOMA

Beckham County Wildcat Runs Casing for Testing

WILCOX OIL CO. has run casing to test its 1 Dugger, C NW SE 12-10n-22w, a rank wildcat 1 mile north of the Doxey townsite and about 7 miles west of nearest production in the Elk City field, Beckham County, western Oklahoma. Tests will be made of a conglomerate granite wash section at 10,265-10,360 ft., in which samples carried fluorescence. Although no drill-stem tests were made, the degree of fluorescence was reported as being comparable to that shown in the same general section, the producing horizon of the Elk City field. The section ran from 60 to 80 per cent sand. Hole was drilled to a total depth of 10,700 ft. Casing was landed near bottom and will be perforated opposite zones to be tested.

Another deep wildcat test is being started in the area. It is Carter Oil Co. 1 Hemphill, NE NW NE 36-10n-33w, located about 3½ miles south of the Wilcox location and about 10 miles southwest of nearest Elk City production. It is projected as a Hoxbar test to a depth of around 10,000 ft.

Shell Oil Co. 1-F State, C SE SW 12-10n-22w, which extends production of the Elk City field another mile to the west, flowed 85 bbl. of 49° oil and 79,000 cu. ft. of gas in a 5-hour production test through 24/64-in. choke. The granite wash pay zone was perforated at 10,004-20 ft. and 9,965-85 ft.

Coronado Oil Co.'s discovery well in western Lincoln County, its 1 Kriel, SW SW NW 20-14n-2w, 3 miles west of Wellston, appears to be a good producer. Casing was perforated at 4,872-82 ft. in Skinner sand, topped at 4,867 ft. Following a hydrafrac treatment, the well was swabbed for 12 hours and then started flowing by heads. Turned into the tanks, it flowed 46 bbl. of oil in 17 hours through 17/64-in. choke. It is now making about 50 bbl. per day with 250 psi. tubing and 450 psi. casing pressure.

Creekmore-Rooney and associates' 1 James, NE NE SE 32-14n-6e, 2½ miles southeast of the Southeast Davenport pool, Lincoln County, flowed at an estimated rate of 6,000,000 cu. ft. of gas daily with a spray of distillate while testing Prue sand at 3,061-86 ft. Well has been killed and will be deepened another 40 to 50 ft. with reverse circulation for further testing.

Kingwood Oil Co. 1 Murphy, SW SW SE 27-18n-1e, new pool-opener 15 miles southwest of Stillwater, Payne County, is being put on the pump for completion. Following an 80-qt. nitro shot, the well flowed by heads 85 bbl. in a 12-hour test. Production is from Bartlesville sand at 4,776-4,829 ft.

OKLAHOMA SUCCESSFUL WILDCAT

Osage County: Peters Petroleum and Sand Springs Home 1 Osage, E/2 SE NW 7-22n-8e, flowed 48 bbl. of oil per day from Red Fork at 2,520-29 ft., TD, sand 690 ft. and 760 ft., lime 835 ft., Buzzard 987 ft., Big lime 2,097 ft., Oswego 2,209 ft. (show of gas) and 2,268 ft., lime 2,459 ft.

OKLAHOMA WILDCAT FAILURES

Coal County: Britton Oil Co. 1 J. K. Polk, C SE SW 23-2n-10e, dry, TD 3,626 ft., first Booch 2,135 ft., second Booch 2,650 ft., Atoka 2,950 ft.

Creek County, So. Kellyville area: Falcon-Seaboard 1 Cornelius, SW NE NE 4-16n-10e, dry, TD 3,142 ft., Hogshooter 813 ft., Checkerboard 1,025 ft., Big lime 1,485 ft., Oswego 1,580 ft., Prue 1,643 ft., coal 1,734 ft., Red Fork 2,080 ft., Inola 2,196 ft., Bartlesville 2,200 ft., Bartlesville sand 2,252 ft., lime 2,390 ft., Booch 2,433 ft., second Booch 2,510 ft., Dutcher lime

2,586 ft., no Dutcher sand, Pitkin 2,729 ft., Mississippi lime 2,790 ft., Woodford 3,039 ft., Viola 3,065 ft., dolomite 3,085 ft., first Wilcox 3,090 ft., shale 3,134 ft., second Wilcox 3,139 ft.

Garvin County: Jordan 1 Richardson, SE SE NE 18-1n-1e, dry, TD 2,501 ft. in Hoxbar.

Hughes County: Puckett Drilling Co. 1 Burkett, SW SW NE 10-7n-10e, dry, TD 3,762 ft., coal 470 ft., Senora lime 600 ft., lime 2,190 ft., Booch 2,380 ft., second Booch 2,510 ft., Hartshorne 2,650 ft., sand 2,930 ft. and 3,040 ft., Wapanucka 3,317 ft., Union Valley 3,585 ft., upper Cromwell 3,618 ft., lower Cromwell 3,707 ft.

Carlock 1 Badger, SW SW SE 1-6n-8e, dry, TD 3,772 ft., Wewoka 410 ft. with slight show of oil, Calvin 670 ft., Senora lime 1,190 ft., Senora sand 1,240 ft., Allen sand 1,330 ft., Earlsboro 1,810 ft., Bartlesville 2,270 ft., lime 2,380 ft., upper Booch 2,780 ft., Union Valley lime 3,630 ft., Union Valley sand 3,644 ft.

Kiowa County: Friedman 1 Everhart, NW SW NE 36-7n-20w, dry, TD 976 ft., granite wash 884 ft. and 925 ft., both shows of oil.

NW Lone Wolf area: Ross 1 Drevs, SW SW SE 21-7n-20w, dry, TD 1,002 ft., Duncan 187 ft., limy sand 907 ft., Pontotoc 932 ft., conglomerate 956 ft.

Lincoln County: Dirickson 1 Eldridge, SE SE NE 19-17n-5e, dry, TD 3,950 ft., Avant 2,270 ft., Hogshooter 2,480 ft., Layton 2,540 ft., Checkerboard 2,785 ft., Big lime 3,265 ft., Oswego 3,300 ft., Prue 3,392 ft., Verdigris 3,480 ft., Skinner 3,589 ft., lime 3,640 ft., Red Fork 3,660 ft., Inola 3,745 ft., Bartlesville 3,756 ft., Bartlesville sand 3,768 ft., Mississippi lime 3,937 ft.

Love County: Coronado Oil Co. 1 Spivey, C SW SW 23-7s-3w, dry, TD 7,000 ft., Cisco 850 ft., Hoxbar 2,100 ft., Hoxbar oolitic zone 3,220 ft., Maroon 6,330 ft., lime 6,425 ft., sand 6,725 ft.

Marshall County, Madill area: Miller Bros. & Taliaferro, NW SW SE 23-5s-5e, dry, TD 470 ft., Arbuckle 450 ft.

Oklahoma County, Coon Creek area: Jordan 1 Marcel, NE NE SE 23-14n-1w, dry, TD 6,565 ft., Woodford 5,461 ft., lime 5,554 ft., shale 5,573 ft., lime 5,682 ft., sandy lime 5,778 ft., lime 5,803 ft., lime and sand 5,850 ft., lime 5,867 ft., dolomite 5,894 ft., sand 5,904 ft., sand and shale 5,942 ft., sand 5,954 ft., lime and shale 5,982 ft., lime 6,128 ft., shale and lime 6,164 ft., lime and sand 6,179 ft., sand, lime, and shale 6,228 ft., shale 6,258 ft., sand 6,264 ft., sand and lime 6,315 ft., lime 6,330 ft., sand and lime 6,336 ft., lime 6,363 ft., Arbuckle 6,450 ft.

Jordan 1 Ringer, NE NE SW 1-14n-1w, dry, TD 5,867 ft., Woodford 5,411 ft., Viola 5,612 ft., Simpson 5,670 ft., lime and sand 5,725 ft., sandy dolomite 5,782 ft., dolomite 5,795 ft., lime and sand 5,818 ft., lime 5,831 ft., sand 5,849 ft., sandy dolomite 6,868 ft., sand 5,884 ft.

Payne County: Mitchell-Gage Drilling Co. 1 Friedeman, SW NW NE 5-19n-2e, dry, TD 4,898 ft., Pawhuska 1,550 ft., Deer Creek 1,750 ft., Hoover 1,765 ft., Checkerboard 3,665 ft., Big lime 3,842 ft., Prue 4,083 ft., lime 4,240 ft., Red Fork 4,265 ft., Mississippian 4,450 ft., Woodford 4,695 ft., Hunton 4,710 ft., Sylvan 4,781 ft., first Wilcox 4,845 ft., second Wilcox 4,890 ft.

Seminole County, Wewoka Lake area: Shirley 1 Hale, SW SW SE 35-8n-7e, dry, TD 3,563 ft., Wewoka sand 1,270 ft., upper Calvin 1,735 ft., middle Calvin 1,810 ft., lower Calvin 1,885 ft., Senora lime 2,195 ft., Senora sand 2,295 ft., Red Fork 2,510 ft., Inola 2,840 ft., Bartlesville sand 2,890 ft., lime 3,100 ft., Booch 3,113 ft., Gilcrease 3,357 ft., Union Valley 3,445 ft., Cromwell 3,506 ft.

Woods County: Harper-Turner et al., 1 Williams, NW NE SW 31-29n-15w, dry, TD 5,930 ft., Lansing 4,384 ft., Oswego 4,594 ft., unconformity 5,084 ft., Mississippi chat 5,158 ft., Mississippi lime 5,210 ft., Woodford 5,580 ft., Sylvan 5,640 ft., Viola 5,690 ft., Simpson 5,828 ft., first Wilcox 5,845 ft., second Wilcox 5,882 ft.

N. CENTRAL TEXAS

Taylor County Gets Ellenburger Hit

WICHITA FALLS.—Drilling & Exploration Co. 1-A McLean, 73-19-T&P, wildcat 1 mile west of Blair in Taylor County, completed this week as an Ellenburger discovery. Top of the formation was 5,445 ft., on elevation of 1,995 ft. Completion was from 10 ft. of pay between 5,482-92 ft., total depth, where it flowed 111 bbl. of 46°-gravity oil a day through 24/64-in. choke, under tubing pressure of 250 psi.

Shamrock Oil & Gas Co. opened Caddo lime pay in the Bessie area centering about 2 miles northwest of Throckmorton. Shamrock's 3 Bessie Rhodes, Section 275, BBB&C Survey, 1½ miles northwest of Throckmorton, flowed 562 bbl. of 37°-gravity oil a day through 16/64-in. choke, from pay at 4,437-46 ft., total depth. Flowing tubing pressure was 205 psi. The section was treated with 500 gal. of mud acid. Shamrock's 1 and 2 wells are producing from Basal Canyon sand around 3,275 ft.

Fourteen miles south of Throckmorton, Grisham-Hunter Corp. 2 Murphy-Kunkel, Section 652-TE&L Survey, A-267, completed as a new Mississippian lime discovery. The well was drilled to 4,846 ft., plugged back to 4,633 ft., and completed through perforations at 4,618-21 ft. After 500 gal. of acid, it flowed 802 bbl. of 43°-gravity oil a day through ¾-in. choke. Gas-oil ratio was 426 cu. ft. and tubing pressure was 120 psi.

Superior Oil Co. opened Strawn pay in Foreman Caddo field of northeast Throckmorton County, with a dual completion of its 1 F. E. Foster, Block 3-61, TE&L Survey. Operators completed the well originally from Caddo lime in open hole from 4,487-4,505 ft. An Otis two-zone pump was installed, which pumped 121 bbl. of 39°-gravity oil a day from perforations in the Strawn sand at 3,761-64 ft., with the lower section closed in. In operation, the dual hookup produces the lower zone through the annular space between tubing and casing, and the upper zone through the tubing.

Fred M. Manning, Inc., 1 Tom D. Parrott, semiwildcat 5 miles east of Throckmorton in Section 2,344, TE&L Survey, topped the Caddo at 4,176 ft. A 1-hour drill-stem test from 4,177-86 ft. recovered 25 ft. of salty mud. A second test had mud from 4,265-75 ft. A 1-hour test from 4,672-75 ft. recovered 2,550 ft. of gas in drill pipe, plus 35 ft. of heavily oil and gas-cut mud. Flowing pressure was 50 psi. and bottom-hole pressure was 700 psi. in 15 minutes. A 1½-hour drill-stem test at 4,673-87 ft. had gas at the surface in 10 minutes and recovered 60 ft. of free oil, plus 300 ft. of oil and gas-cut mud, with some free oil. Flowing pressure ranged from 50-200 psi. and bottom-hole pressure was 2,300 psi. A 1-hour test from 4,687-97 ft. had gas in 3 minutes and recovered 1,520 ft. of free oil and 30 ft. of heavily oil and gas-cut mud. Flowing pressure was 250 psi. Operators were running 7-in. casing.

James H. Snowden 1 Ludie Dickey Unit 3, semiwildcat extension well ½ mile southwest of Woodson in Section 685, TE&L Survey, topped pay sand at 2,848 ft., drilled to 2,876 ft. and set pipe at 2,844 ft. On potential test it flowed 73 bbl. of oil a day through ½-in. choke.

In Wise County, Signal Oil & Gas Co. and Lofflan Bros. 1 J. L. Gentry, wildcat ¾-mile north of Cottondale, Block 82, Lower Matagorda CSL Survey, acidized the Strawn with 4,000 gal. from 3,570-3,627 ft., after which it was swabbed and flowed, by heads, at the rate of 8 bbl. of oil an hour. Operators pulled tubing and were running rods and preparing to place the well on the pump.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) SUCCESSFUL WILDCATS

Archer County: E. B. Clark Drilling Co. 1 Ferguson Bros., Sec. 1, SPRR Sur., A-416, 2 mi. N Mankins, TD 1,735 ft., pumped 30 bbl. of 42°-gravity oil a day.

Comanche County: Sohio Petroleum Co. 1 Fred Jones, 31-V-ETRR Sur., 3 mi. NE Sidney, TD 2,844 ft., elev. 1,430 ft., Mississippian 2,334 ft., pay 2,330 ft., flowed 167 bbl. of 39°-gravity oil a day, 24/64-in. choke, GOR 1,909 cu. ft., CP 420 psi., TP 390 psi.

Haskell County: Texas Pacific Coal & Oil Co. 1 Juliana McGregor, Sec. 46, G. G. Alford Sur., 6 mi. W O'Brien, TD 6,150 ft., elev. 1,524 ft., PB 4,994 ft., Strawn sand 4,970 ft., flowed 210 bbl. of 39°-gravity oil a day, 20/64-in. choke, GOR 248 cu. ft., TP 475 psi., CP 500 psi.

Stephens County: G. E. Kadane & Sons 1 Sayles, Sec. 1,265, TE&L Sur., 7 mi. NW Breckenridge, TD 4,334 ft., elev. 1,158 ft., pay 4,313 ft., flowed 221.6 bbl. of 41°-gravity oil a day, 11/64-in. choke, GOR 1,750 cu. ft., CP 1,675 psi., TP 1,275 psi.

Wilbarger County: J. O. Hancock 1 W. T. Waggoner Est., Sec. 1, SPRR Sur., A-534, 6 mi. S. Harrold, TD 1,919 ft., pay 1,912 ft., pumped 75 bbl. of 38°-gravity oil a day.

NORTH CENTRAL TEXAS (DISTRICTS 9 AND 7-B) WILDCAT FAILURES

Archer County: Luke Grace Drilling Co. 1 L. F. Wilxon "X," Blk. 64, ATNC Subd., 10 mi. NNE Archer City, dry, TD 4,095 ft., sand with odor 3,988-94 ft.

Baylor County: J. J. Lynn 1 Claude Cowan, Sec. 205, T&NO Sur., A-359, 9 mi. E Seymore, dry, TD 5,334 ft., had oil-cut mud at 2,758-2,840 ft.

Comanche County: H. L. Hawkins 1 Earnest Cadenhead, Vena Campbell Sur., A-151, 2½ mi. SE Sidney, dry, TD 2,775 ft., elev. 1,541 ft., Marble Falls 2,345 ft., Ellenburger 2,615 ft.

Coryell County: Sieber Hotel Co., Inc., 1 Gus Weatherly Est., H. Farley Sur., 3½ mi. W Gatesville, dry, TD 1,512 ft., no shows.

Hood County: Sunray Oil Corp. 1 H. B. Little, R. W. Boyce Sur., 4 mi. NE Thorp Springs, dry, TD 6,138 ft., elev. 845 ft., Caddo 3,545 ft., Marble Falls 5,085 ft., Smithwick shale 5,440 ft., Barnett 5,625 ft., Ellenburger 5,882 ft.

Jack County: Warren Oil Corp. 1 John Carter, Sec. 2,781, TE&L Sur., A-789, 4 mi. N Jermyn, dry, TD 4,650 ft., elev. 1,066 ft., Caddo (estimated) 4,500 ft.

Jones County: Bridwell Oil Co. 1 E. T. George, Sec. 25, HT&B Sur., 1 mi. NW Lueders, dry, TD 2,187 ft., elev. 1,564 ft.

W. H. Bryant 1 T. H. McBay, Sec. 7, D&DA Sur., 2 mi. NW Avoca, dry, TD 2,295 ft., elev. 1,544 ft.

Montague County: W. H. Bryant 1 J. A. Fooshee, Blk. 129, Belcher Subd., A-17, 4 mi. S. Belcherville, dry, TD 6,265 ft., elev. 943 ft., Caddo 5,844 ft.

S. D. Johnson 1 Crenshaw Est. "A," W. Wallace Sur., A-834, 1 mi. N Belcherville, and 2,000 ft. S No. 1, dry, TD 5,803 ft.

Nolan County: Ryan, Hays & Burk 1 S. L. McNay, Maria Zuniga Sur. 298, SE corner of county, dry, TD 5,532 ft., elev. 2,136 ft., Valera 1,880 ft., Flippen 3,165 ft., reef 4,370 ft.

Shackelford County: A. C. Humphrey and Eck Gillespie 1 G. W. Reeves, Sec. 168, BBB&C Sur., 7 mi. N Lueders, dry, TD 1,967 ft.

Stephens County: R. W. Fair and Don L. Choate 1-A Marion Graham, 81-4-T&P, 8 mi. NW Strawn, dry, TD 1,866 ft., oil show 1,525 ft., gas show 1,590-1,610 ft.

S. C. Herring 1 A. H. Cox, B. J. McGaha Sur., A-106, 6 mi. SE Woodson, dry, TD 4,781 ft., elev. 1,174 ft., Caddo 3,669 ft., Mississippian 4,497 ft.

Taylor County: Geochemical Surveys, Inc., 2 J. W. Harris, Sec. 80, T. D. Johnson Sur., 4 mi. NE Abilene, dry, TD 1,822 ft., elev. 1,660 ft.

Wichita County: W. H. Hammon 1 C. Rathgeber Est., Blk. 20, K&K Subd., Cherokee CSL, A-173, 4 mi. S Wichita Falls, dry, TD 5,530 ft.

Franklin M. Love 4 W. J. Sheldon, Blk. 221, Waggoner Co. Subd., 2 mi. N Electra, dry, TD 1,981 ft.

Young County: J. W. Baldwin et al., 1 J. J. Engles, Sec. 627, TE&L Sur., A-785, ½ mi. SE Jean, dry, TD 3,140 ft.

CALIFORNIA

California Activity Slated to Drop Off

LOS ANGELES—California drilling activity is scheduled to remain at its present low level, or sink even lower, if weekly filings of applications to drill offer a reliable gage. Last week, according to Division Oil and Gas filings, only 17 new applications were received. This was by far the lowest number so far this year. Notices to deepen or redrill old wells even exceeded the filings for new wells, totaling 18 for the week.

In the Cuyama Valley, the week was marked by the almost certain addition of a fourth oil field; on the unfavorable side was the abandonment of two more unsuccessful wildcats. The fourth discovery was assured by Hancock Oil Co. 6-10 Hancock-Oceanic pumping 140 bbl. in 21 hours, of which 60 bbl. was new oil. Production is being obtained from the shallower Morales sand, topped at 1,695 ft.

The two abandonments were Independent Exploration Co. 71-29 Stubblefield in Section 29-10n-24w, in eastern Cuyama Valley; Richfield Oil Corp. 1 Apache Unit in Section 22-8n-24w, located in the Ventucopa area. The latter was carried to a total depth of 10,563 ft., with no showings of special importance being reported.

At the Tejon Reserve area in Kern County, Drilling & Producing Co. is attempting to recomplete the well it completed as a deeper pool discovery last November. At that time it pumped 40 bbl. daily from the Rose Bright sand at 4,651-93 ft. New hole was sidetracked below 4,520 ft. and carried to 4,756 ft. The well blew out while being swabbed but was soon controlled and operator is attempting to establish flowing production from the interval 4,643-4,756 ft.

Tide Water Associated Oil Co., by completion of its 27 Porter as a 175-bbl. per day pumper in an oil sand from about 4,000 to 4,156 ft. total depth, gave the Aliso Canyon field a new, shallower oil zone. Located in Section 28-3n-16w, Los Angeles County, it is producing 18.5°-gravity crude from a zone about 1,500 ft. higher than the established Porter pay.

Also in Los Angeles County, in the Newhall-Placerita area, Willhoit & Willhoit are attempting to open oil production some 2 miles southeast of Placerita field. Drilled to 1,173 ft., their 1 Willhoit yielded a small amount of 48-50°-gravity crude upon swabbing. The well swabbed dry, however, and at last report the operator was preparing to wash the hole in an effort to increase oil flow.

CALIFORNIA WILDCAT FAILURES

Contra Costa County, Brentwood area: E. A. Bender 1 Wallace, 21-1n-3e, dry, TD 4,659 ft., elev. 80 ft.

Fresno County, Burrel area: Pacific Western Oil Corp. 38 Burrel, 22-16s-18e, dry, TD 7,230 ft., elev. 198 ft.

Kern County, Pleito Hills area: Continental Oil Co. R-1 KCL, 36-11n-21w, dry, Coal Oil Canyon sand 3,273 ft., TD 5,565 ft., elev. 1,550 ft.

Cuyama Valley area: The Texas Co. 1 Stubblefield-Fickle, 20-10n-24w, dry, TD 3,993 ft., elev. 2,718 ft.

Los Angeles County, Haskell Canyon area: G. R. Urich 1 Burger, 36-5n-16w, dry, Mint Canyon 1,712 ft., TD 1,893 ft., elev. 1,575 ft.

Whitney Canyon area: Rothschild Oil Co. 2 Phillips, 7-3n-15w, dry, TD 3,000 ft., elev. 1,385 ft.

San Benito County, Hollister area: A. S. Mayes 2 Well, 12-12s-5e, dry, TD 1,678 ft., elev. 262 ft.

San Luis Obispo County, Carrizo Plains area: Carrizo Petroleum Co. 1 Carrizo, 26-28s-18e, dry, TD 2,204 ft., elev. unreported.

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Santa Barbara County, Goleta area: Yellowstone Oil Co. Y-1 Hollister, 3-4n-29w, dry, TD 1,398 ft., elev. 340 ft.

APPALACHIAN FIELD

West Virginia Wildcat Misses Production

PITTSBURGH.—In Portland district, Preston County, West Virginia, Snee & Eberly 2 Cora E. Lewis, elevation 1,953 ft., resulted in a dry hole. A show of gas in the chert (5,314 ft. and 5,412 ft.) was shot, with unfavorable results; no Oriskany sand was found; well is being plugged at 5,704 ft. In Dry Fork district, Tucker County, Cumberland & Allegheny Gas Co. 1-A-425 Jason Harman, elevation 3,304 ft., resumed drilling after cementing 7-in. casing and is at depth of 7,910 ft. In Tucker district, Wirt County (Limestone Hill area), United Fuel Gas Co. 6552 R. J. Moore, elevation 994 ft., is shut down at a depth of 5,329 ft. in the Oriskany sand which was topped at 5,302 ft. Gas gaging 862,000 cu. ft. was struck at 5,321-26 ft. In the city of Williamson, Mingo County, R. M. Kloze, Trustee 1 Williamson Mining & Manufacturing Co. resulted in 2,929,000 cu. ft. of gas after second shot in the Berea sand, total depth 3,041 ft. In Baileysville district, Wyoming County, United Producing Co. 94-1666 W. M. Ritter Lumber Co., gaged 4,574,000 cu. ft. of gas after shot in the Berea sand, total depth 3,655 ft.

In Allegheny Township, Westmoreland County, Pennsylvania, Peoples Natural Gas Co. 1-3900 Fred J. Bazay et ux., tested 1,017,000 cu. ft. of gas, and was completed at a total depth of 1,891 ft. In Wharton Township, Fayette County, Snee et al., 3 Indian Creek Coal & Coke Co., elevation 2,165 ft., commenced acidizing with 1,500 gal. In Georges Township, Orville Eberly et al., 1 N. E. Murphy, elevation 2,560 ft., is cementing hole at 7,630 ft.

WEST VIRGINIA WILDCAT FAILURE

Preston County, Portland district: Snee & Eberly 2 Cora E. Lewis, elev. 1,953 ft., dry, Tully lime 4,563-78 ft., chert 5,314 ft. and 5,412 ft., with show of gas, TD 5,704 ft.

CANADIAN FIELDS

Stettler Classed as Major Field

CALGARY.—Stettler, year-old Devonian oil discovery 95 miles northeast of Calgary, can now be classed as a major oil field, a field with a reserve in excess of 100,000,000 bbl. That important conclusion has been reached by Stettler's discoverer, the Canadian Gulf Oil Co. In fact, unofficial estimate of Gulf's Stettler reserve is around 150,000,000 bbl., which doesn't include the indicated reserves under that portion of the structure held by other companies or still standing as Crown Reserve.

The field was opened by Gulf's 4 N. J. Ellis, and as at Leduc, has two Devonian pay zones, D2 and D3. On the wells drilled to date, D2 pay thickness has averaged about 80 ft., while D3 averages about 33 ft. The oil is heavier than that in the Edmonton area fields, with Stettler crude ranging from 28° to 30°.

A few months ago, Stettler was extended about 3 miles northward by British Empire Oil Developments, Ltd., Calgary independent owning a half section lease. This company indicated an open flow potential around 800 bbl. daily in a 30-ft. D2 pay zone at its 1 well (with D3 too low for production). British Empire's 2 well recently found more than twice the pay thickness in D2 zone, and is now coring at 5,420 ft. for test of D3 possibilities.

Canadian Gulf has so far completed six Stettler oil wells, and has one more under test at present.

Four major oil companies teamed in the "Northern Foothills Agreement," have confirmed their entry into the oil and gas exploration play in northeastern British Columbia. The team includes: Shell Oil Co., Socony-Vacuum Exploration Co., Canadian Gulf Oil Co., and Texaco Exploration Co. First phase of the exploration involves four Crown geological permits, covering over 1,000,000 acres. Additional permits have been applied for, and details of these will be available soon.

Three Calgary independents are moving in equipment for an exploratory test in south central Alberta, about 100 miles southeast of Calgary, to probe for oil prospects in the Devonian. The three firms, each with one-third interest in the project, are: Anglo-Canadian Oil Co., Ltd., Calmont Oils, Ltd., and the Calgary & Edmonton Corp., Ltd. The initial venture is Anglo-Calmont, C. & E., Turin 1, in LSD 6, 29-11-18w4, about 4½ miles southeast of Turin railpoint and 23 miles northeast of Lethbridge. Nearest producers include natural gas wells 12 miles to the southeast and California Standard's Taber oil wells around 15 miles southeast of the new wildcat. Turin 1, with prime objective the Devonian, will have a probable completion depth of around 5,000 ft. Drilling operations are expected to get under way shortly.

Twenty-one wells were completed in Alberta during the past week, including 17 successful oil producers, 1 gas discovery completion, and 3 wildcat failures. The week's total boosts completions for the

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period Jaunary 1 to April 28 to 227 wells: 155 oil wells, 8 gas wells (7 being discoveries), and 64 dry holes.

A lower Cretaceous natural gas discovery well at Jarvie was capped this week, pending availability of market. The Jarvie wildcat, in north central Alberta, was drilled by Imperial.

The three wildcat failures this week include: Schoonmaker & McCumming's Saddle Lake venture, Rio Bravo's Red Will test, and Imperial Oil's Kathleen wildcat in northwest Alberta.

PERMIAN BASIN

Apparent Devonian Strike Tested in Martin County

MIDLAND.—In northwestern Martin County, about ½ mile east of the Midland County line and 8½ miles down from the north line of Martin County, The Texas Co. had prospects of a Devonian discovery at its 1-X University, located in the NW NE 17-7-University Lands Survey. Nearest production is 11 miles south in Mabee Grayburg and San Andres field.

The first drill-stem test in the Devonian, from 12,149-12,322 ft., total depth, had no gas at the surface, but mud began flowing in 67 minutes. Oil flowed in 23 minutes and when turned into tanks, gaged 31 bbl. of 43.8°-gravity oil in 1 hour. Recovery was 50 ft. of mud and oil, plus 180 ft. of water, which was believed to be the water blanket used in the test.

A second test of the same interval had gas in 85 minutes, and mud in 110 minutes. It flowed into pits 85 minutes, making mostly mud, then turned into tanks flowing 20-25 bbl. of oil an hour. Operators planned to flow the well for about 3 hours before coming out of the hole with the tool.

Tentative top on the Devonian, on elevation of 2,944 ft., was first placed at 13,228 ft., then later at 12,285 ft. The well was originally projected to 5,000 ft., and at 5,265 ft., in dry San Andres limestone, it was decided to continue to 10,800 ft. to test the Pennsylvanian, and possibly to 13,000 ft. to explore the Ellenburger.

In southwestern Martin County, Gulf Oil Co. 1-E-B George W. Glass, 13,500-ft. wildcat in the SW NE 13-39-1n-T&P, was drilling below 5,067 ft.

Completion of R. E. Smith 2 Bertha Clark, 123-25-H&TC, Scurry County, has narrowed the gap between Diamond M and Sharon Ridge Canyon lime fields. The well is ½ mile south of nearest production on the west side of Diamond M and ¼ mile north of production in Sharon Ridge. Completion was 302.5 bbl. of 45°-gravity oil a day through ¼-in. choke, from open hole at 6,582-6,603 ft.

Between Progress Petroleum Co. 1 Buffaloe and Cogdell field of southern Kent County, Warren Petroleum Co. 1 Dora Cunningham, 467 ft. out of the southeast corner of 653-97-H&TC, reported top of the reef at 6,830 ft., minus datum point of 4,405 ft. It was running about flat with the Buffaloe area, but some 125 ft. low to Cogdell structure.

Stanolind Oil & Gas Co. 1 Gibson, south offset to the 1 Buffaloe, in 550-97-H&TC, had top of the reef at 6,811 ft., minus 4,363 ft., which was some 15 ft. low to the discovery. It was to drill ahead below total depth of 6,815 ft.

In Cogdell field, J. A. Chapman Producing Co. completed its 4 D. M. Cogdell, 467 ft. out of the southwest corner of Section 771, as a ½-mile north extension. Daily flowing potential was 389 bbl. of 41°-gravity oil, through ¾-in. choke, after acidizing pay from 6,678-6,760 ft. with 750 gal.

Wolfcamp production for the southern portion of the same field has been indicated at The Texas Co. 15 P. L. Fuller, southeast corner of Section 652. Top on the section was not reported, but on elevation of 2,451 ft. it was said to be some 200 ft. low to Chapman & McFarlin 6 Cogdell, Wolfcamp pay discovery on the field's northeast side. The 15 Fuller ran a 2-hour and 45-minute drill-stem test from 5,146-61 ft., in sand, which showed gas in 45 minutes, mud in 1 hour and 43 minutes, followed by oil 2 minutes later, and during the last hour of the test it flowed 15 bbl. of oil. A 45-minute test from 5,143-81 ft. had gas in 3½ minutes and flowed oil in 14 minutes, tanking 31 bbl. of 43°-gravity oil the last 31 minutes of the test. Recovery was circulated out. A core from 5,181-99 ft. recovered 16 ft. of black shale and operators continued drilling below 5,375 ft. at last report.

Barnsdall Oil Co. and Seaboard Oil Co. 1 R. L. Spires, wildcat in the NE SW 22-4-H&GN, 6 miles north of Cogdell field, was running electrical surveys, with total depth at 7,564 ft. in dry Ellenburger limestone, topped at 7,499 ft., or minus 5,342 ft. The well had no shows in side-wall cores around 4,800 ft., identified as Wolfcamp.

Amerada Petroleum Corp. completed its 1 Weathers, 94-25-H&TC, second well and one location south offset to the Von Roeder discovery of southeastern Borden County. Producing from open hole at 6,820-50 ft., the well flowed 624 bbl. of oil in 10½ hours through ½-in. choke, without acid, and was given a daily potential of 1,430 bbl. Gas-oil ratio was 1,320 cu. ft. and flowing tubing pressure was 900 psi. Top on the reef was 6,818 ft., minus 4,455 ft., which was some 12 ft. high to Amerada's 1 Von Roeder.

WEST TEXAS (DISTRICTS 8 AND 7-C) SUCCESSFUL WILDCATS

Borden County, 1 mi. W extension N. Vincent field: Castleman & O'Neill 1-A T. L. Griffin, approximately NE NE 51-25-H&TC, TD 6,889 ft., elev. 2,366 ft., top reef 6,864 ft., 7-in. casing 6,866 ft., flowed 2,010 bbl. of 46°-gravity oil a day, natural, 1-in. choke, GOR 1,150 cu. ft., TP 200 psi., CP 900 psi.

Garza County: L. F. Long 1 W. J. Long, Sec. 702, Blk. A-665, Jasper Hays & I. Scott Sur., 5½ mi. SE Southland, TD 3,420 ft., elev. 2,678 ft., pumped 84 bbl. of 36°-gravity oil a day from San Andres pay, open hole 3,285-3,420 ft., 15,000 gal. acid.

WEST TEXAS (DISTRICTS 8 AND 7-C) WILDCAT FAILURES

Crane County: Humble Oil & Refining Co. 1-C Jax M. Cowden, SE NE 66-X-CCSD&RGNG, 3 mi. SW Block 31 field, TD 9,133 ft., PB 4,209 ft., elev. 2,473 ft., Devonian 6,525 ft., Ellenburger 9,015 ft.

Gaines County: Atlantic Refining Co. 1 Hugh Corrigan, SW SW 390-G-CCSD&RGNG, 2 mi. NW West Seminole field, dry, TD 5,144 ft., elev. 3,473 ft., anhydrite 2,070 ft., Yates 3,170 ft., San Andres 4,740 ft.

Irion County: M. C. Moore 1-B W. M. Noelke Est., Sec. 1, Tom Green CSL, 10 mi. SW Mertzon, dry, TD 1,502 ft.

Kent County: Estel S. Heyser, Jr., 1 L. T. Lohman Tr., 42-G-W&NW, 8 mi. SW Clairemont, dry, TD 7,541 ft., elev. 2,129 ft., Strawn 6,778 ft., Mississippian 7,280 ft., Ellenburger 7,485 ft.

Mid-Continent Petroleum Corp. 1 Bilby Wallace Tract 3, SW SW SW 776-97-H&TC, 5 mi. NE Cogdell field, dry, TD 7,415 ft., elev. 2,032 ft., San Andres 980 ft., Clear Fork 1,860 ft., Wolfcamp 3,700 ft., Strawn 6,701 ft., Mississippian 7,028 ft., Ellenburger 7,336 ft.

Pecos County: Engle Oil Corp. 1 Annie H. McKenzie, Sec. 26, Blk. 604, University Lands, 9 mi. S Bakersfield, dry, TD 3,067 ft., elev. 3,147 ft.

Runnels County: Delaware Drillers, Inc., and T. W. Murray 1-A Bryan Clayton, Sec. 135, ETRR Sur., 4 mi. NW Talpa, dry, TD 4,385 ft., elev. 1,827 ft., Ellenburger 4,185 ft.

E. C. Johnston 1 F. B. Hoffman, 179-acre lease, W part Sec. 14, T. T. Williams Sur, 3 mi. NE Ballinger, dry, TD 3,807 ft., elev. 1,756 ft., Surratt sand 2,371 ft., Gunsight 2,885 ft., Gardner sand 3,774 ft.

Scurry County: Sun Oil Co. 1 J. W. Layne, SE NE 175-97-H&TC, 6 mi. SW Snyder, 1 mi. S Schattell well, dry, TD 7,661 ft., elev. 2,354 ft., reef 6,902 ft., Strawn by samples 7,580 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Humble Oil & Refining Co. prepared to abandon its 1 Federal-Hobbs, Eddy County wildcat in 24-20s-24e, 12 miles southwest of Lakewood. Total depth was 11,580 ft. in Ellenburger dolomite topped at 11,202 ft. Drill-stem tests at 11,383-11,476 ft. and 11,476-11,580 ft. recovered the water blanket and drilling mud on the first interval; water blanket, drilling mud, and salt water on the latter test.

Magnolia Petroleum Co. 1-B Walker, 6-9s-38e, 1½ miles northeast of Bough field discovery, was drilling in lime at 9,380 ft. A drill-stem test at 9,016-9,112 ft., open 3 hours, recovered water blanket plus 30 ft. of slightly gas-cut mud.

Magnolia 1-D Santa Fe-Pacific, SW SE 22-9s-36e, extended production ½ mile north of nearest production in Crossroads field. Completion was from open hole in the Pennsylvanian from bottom of casing at 9,650 ft. to 9,652 ft., total depth. Daily potential was 362 bbl. of 48°-gravity oil a day, natural, flowing through 9/64-in. choke on 2-in. tubing set at 9,650 ft.

Stanolind Oil & Gas Co. 2-A Anna Foster, NE SW 23-19s-38e, west offset to its recent discovery, southeast of Hobbs field, had total depth at 7,607 ft. and was testing. After shut in for 10 hours it swabbed 10 bbl. of fluid in 2 hours, cutting 9 per cent drilling fluid. After shut in 12 hours it swabbed 17 bbl. of oil in 12 hours, cut 3 per cent. Operators were acidizing.

EASTERN TEXAS

Anderson County New Pool Extended Southeastward

DALLAS.—The Texas Co. 1 S. C. Avant, sewiwildcat ⅛ mile southeast of Tennessee Colony, in Anderson County, extended Rodessa production 1,000 ft. southeast of Continental Oil Co.'s discovery, the 1 Royall National Bank. At last report, the 1 Avant had acidized the upper section from 8,896-8,912 ft. with 9,000 gal. in two stages, and was testing. Flowing through 12/64-in. choke, the well gaged 59.34 bbl. of 45°-gravity oil a day, under tubing pressure of 375 psi., and with gas-oil ratio of 3,600 cu. ft. The well had flowed gas and distillate from 112 Rodessa perforations from 9,025-31 ft. and 9,011-17 ft., and was waiting on state potential from that section. Continental's strike flowed 131 bbl. of oil a day from the upper Rodessa and 2,800,000 cu. ft. of gas daily from the lower section.

Stanolind Oil & Gas Co. 1 W. T. Slater, R. W. Smith Survey, Harrison County, was shut in for completion potential after testing in the Pettit lime from 6,487-97 ft., and 6,502-08 ft. The formation was treated with 4,000 gal. of acid which produced a flow of 4,390,000 cu. ft. of gas daily plus 192 bbl. of 62°-gravity distillate, flowing through 18/64-in. tubing choke. Flowing tubing pressure was 2,290 psi., and shutin casing pressure was 2,360 psi. Prior to acid treatment, the well gaged 2,861,000 cu. ft.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D.C. Notice is hereby given that two units of land containing in all 400 acres in Ts. 29 and 30 N., R. 113 W., 6th P.M., Wyoming, within the known geologic structure of the Big Piney field, will be offered for oil and gas leasing, through competitive bidding, at 1 p. m. on May 17, 1950, when bids will be open. The details of the lease offering, how and where to file bids, and a description of the lands may be obtained by addressing an inquiry to the Manager of the Land and Survey Office, Cheyenne, Wyoming, or to this office. Marion Clawson, Director.

of gas a day through 23/64-in. choke. Operators set retainer at 6,514 ft. and squeezed holes at 6,559-68 ft., which had produced some 3,000,000 cu. ft. of gas a day, along with 2,200 bbl. of salt water. Completion of this test will extend the Woodlawn wet gas area 1 mile to the south. Location of the field is 5 miles northeast of Woodlawn.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P) SUCCESSFUL WILDCATS

Falls County: James E. Franks 2 Dr. Sam Sparks, J. J. Acosta Sur., 2 mi. S. Satin, TD 1,144 ft., elev. 427 ft., Georgetown 1,093 ft., pumped 14 bbl. of 33.8 -gravity oil a day, plus 14 bbl. water.

Wood County: B. B. Orr 1 Childress, West Walker Sur., 1 mi. N Pine Mills field, TD 5,564 ft., elev. 420 ft., perf. sub-Clarksville 4,788-4,802 ft., flowed 223 bbl. of 25 -gravity oil a day, 1/8-in. choke, TP 300 psi., GOR 700 cu. ft.

EAST TEXAS (DISTRICTS 5, 6, AND 6-P) WILDCAT FAILURE

McLennan County: Fred Falkin 1 L. F. Wardlaw, I. Galindo Sur., 10 mi. SE Waco, dry, TD 2,006 ft., elev. 430 ft., Buda 897 ft., Edwards 1,165 ft., Glen Rose 1,458 ft. by samples.

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MICHIGAN

New East Pullman Field Gets Rapid Development

MOUNT PLEASANT—By virtue of the current drilling campaign in the new East Pullman field, Allegan County, the shallow southwestern district of Michigan is leading all other individual areas in completions. This week three new, shallow, 1,130-ft. Traverse oil wells were added in this pool and two others were scheduled to be completed before the end of the week.

Wells in this field initial from 25 to 250 bbl. after acid. East Pullman was discovered late in 1949 by Ford Oil Co. and Basin Oil Co. but it was not until early this year that the play started to pay off in drilling activity and commercial production. It took several acid shots to boost the discovery well from 7 bbl. of oil a day to an average of 100 bbl. flowing.

Since the completion of the discovery, eight producers and no dry holes have been drilled in the pool. All wells were drilled by Ford and Basin with the exception of one producer and one completing well. On the basis of early estimates, the field, both in area and total possible recovery, appears to be the most important southwestern discovery in the past 10 years.

Sun Oil Co.'s 2 Wood, NW SE SE 19-12n-13w, east 20-acre offset to its Bishop field Traverse oil discovery, flowed oil on drill-stem test from the Traverse at 2,234 ft., total depth. The test also showed 200 ft. of salt water. This is the second well to be drilled since the discovery, and was reported to be about 5 ft. lower than the pool opener. Another offset, diagonally southwest, was dry in the Traverse.

MICHIGAN SUCCESSFUL WILDCATS

Ogemaw County, Rose Township: United Drillers & Producers, Inc., 3 State-Rose, SE SW NE 4-24n-3e, 18 bbl. of oil from Richfield after acid, TD 4,270 ft.

Tuscola County, Elmwood Township: C. W. Collin 1 Mullen, SE SE SE 17-14n-10e, Traverse 1,880 ft., 3,500,000 cu. ft. of gas, TD 1,885 ft.

MICHIGAN WILDCAT FAILURES

Kalkaska County, Excelsior Township: Neil Wagenaar and Edward Wagner 1 Phoenix Petroleum Co., NW NW SW 13-27n-6w, Dundee 2,726 ft., dry, TD 2,926 ft.

Mecosta County, Deerfield Township: Mercer Oil Co., Inc., 1 Howe, NW SE NE 26-13n-9w, Dundee 3,476 ft., dry, TD 3,581 ft.

Muskegon County, Fruitland Township: Robert Devine and J. W. Lang Co. 1 Schneider et al., NE NE SW 30-11n-17w, Dundee 2,073 ft., dry, TD 2,200 ft.

Tuscola County, Novesta Township: Lakeland Oil Corp. and Muskegon Development Co. 1 Ridley, SE SW SE 5-13n-11e, Dundee 2,539 ft., dry, TD 2,750 ft.

Van Buren County, Columbia Township: Arthur J. Gilmore 1 Mathies, SW NW NW 28-1s-13w, Traverse 1,152 ft., dry, TD 1,155 ft.

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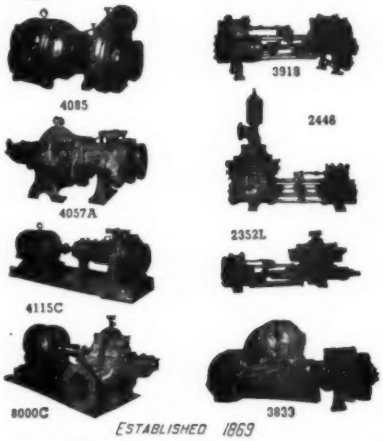

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MISSISSIPPI

Well Near Natchez Continues Testing

JACKSON—Two miles north of the city of Natchez, Humble Oil & Refining Co. has tested oil in the 1 James S. Giles et al., 4-7n-3w, Adams County. Top of the Baker sand was reported at 5,882 ft., and a drill-stem test was run in open hole at 5,878-85 ft. while the well was being drilled. Using ¼-in. top and bottom chokes, it recovered 630 ft. of 42°-gravity oil, 540 ft. of salt water, and 270 ft. of mud in 18 minutes. Bottom-hole flowing pressure was 1,405 psi.

The test was drilled to a depth of 10,167 ft. and operators set 7-in. pipe on bottom. Operators reperforated the interval at 10,159-60 ft., and after the tool had been open 1 hour and 28 minutes, the well started making salt water through ¼-in. top and 5/16-in. bottom chokes. Top pressure was 2,000 psi. Top choke was changed to ⅛-in. choke, and on a 10-hour test the well flowed at the rate of 216 bbl. of fluid per day, being 50 per cent oil. After flowing 4¼ hours, the well made 99 per cent salt water. At last report, operators were preparing to squeeze perforations.

In the same county, J. D. Reese completed the 1 J. D. Reese, 19-5n-3w, discovery of Glen Aubin field. The well pumped 49 bbl. of oil plus an estimated 60 bbl. of water per day. Operator plans to install a larger pump on this well to increase production.

Considerable interest is being shown in the Peterson Drilling Co. 1 Ligon-Mazique, 20-5n-3w, wildcat in the southwestern part of Adams County. A drill-stem test run at 6,435 ft. recovered 170 ft. of oil-cut mud and 210 ft. of salt water. Operators are presently preparing to run a drill-stem test below 6,457 ft.

MISSISSIPPI SUCCESSFUL WILDCATS

Adams County: Peterson Drilling Co. 1 A. D-1 Mrs. C. L. S. McKittrick et al., 50-7n-3w, TD 10,422 ft., perf. 10,300-10 ft., 37 bbl. of oil per day on pump, TP 20 psi., GOR 500, 27° gravity.

J. D. Reese 1 George Armstrong, 19-5n-3w, TD 7,015 ft., perf. 6,588-91 ft., 49 bbl. of oil per day on pump, 36° gravity.

MISSISSIPPI WILDCAT FAILURES

Adams County: Petersen Drilling Co. 1 A. R. Ligon-C. L. Mazique, 20-5n-3w, dry, TD 6,737 ft.

Jefferson County: Claypool-Proctor-Kemp Drilling Co. 1 Emmett Gaylor, 13-8n-1w, dry, TD 10,293 ft.

Wilkinson County: American Republics Corp. 1 Crosby Lumber & Manufacturing Co.-Young, 15-4n-2w, dry, TD 7,505 ft.

ALABAMA WILDCAT FAILURE

Choctaw County: H. C. Sloan 1 Robert Thornton, 5-10n-2w, dry, TD 3,466 ft.

FLORIDA WILDCAT FAILURE

Levy County: J. A. Abott 1 Prudential Lumber Co., 34-13s-16e, dry, TD 2,013 ft.

LA.-ARK.

Caddo Parish Wildcat Delayed by Casing Job

SHREVEPORT—Bert Fields 1 Thigpen-Herold, Caddo Parish wildcat in 23-16n-16w, 6 miles south of Greenwood, was delayed by split casing around 8,665 ft., but had made a cement job on the split at last report and was preparing to perforate and test in the "D" sand of the Cotton Valley. Top of the sand was 8,650 ft., and total depth was 9,004 ft. A drill-stem test with packer at 8,600 ft., using 500 ft. of water cushion, produced a good blow but swabbed acid water and mud with a show of gas.

Southwest Natural Producing Co. 1 M. E. Colvin, 31-20n-2w, Lincoln Parish distillate discovery was waiting on gage. The Vaughn section of the Cotton Valley was topped at 8,734 ft., and perforations were made from 8,738-56 ft. with 72 shots. With packer at 8,700 ft., it flowed at the rate of 7,000,000 cu. ft. of gas daily through ⅜-in. choke, plus an estimated 50 bbl. of distillate per 1,000,000 cu. ft. Flowing tubing pressure was 2,500 psi., and on ¼-in. choke registered 2,700 psi.

In Miller County, Arkansas, Pan American Southern Corp. 1 Magee, 19-17s-25w, was drilling below 5,148 ft. in the lower Glen Rose. Sample tops released were: Tokio 3,050 ft., Paluxy 3,500 ft., massive anhydrite 5,010 ft. A core in the Paluxy from 3,635-39 ft. recovered shaly sand with no shows.

Burnett Drilling Co. 1 May, NW SE 8-14s-22w, Nevada County, was drilling at 4,165 ft. in the Cotton Valley, topped at 4,110 ft. Operators reported a drilling break at 2,546 ft. and ran a 10-minute drill-stem test from 2,545-50 ft. There was no pressure and recovery was 150 of oil, estimated at 32° gravity, plus 15 ft. of mud, and no water. The section was believed to be the Hill sand.

Garland Anthony Oil Co. 1 Mike Berg, 15-13s-17w, Ouachita County, was drilling at 3,760 ft. in the Smackover. It is a new operation and was first reported as a 3,500-ft. test.

NORTH LOUISIANA WILDCAT FAILURE

Caldwell Parish: John S. Neilson 1 Chas. G. Simmons, SE SE NW 31-15n-4w, dry, TD 5,501 ft., elev. 74 ft., Midway 2,567 ft., upper Cretaceous 3,223 ft., base annona 3,490 ft., Tuscaloosa 4,052 ft., lower Cretaceous 4,805 ft.

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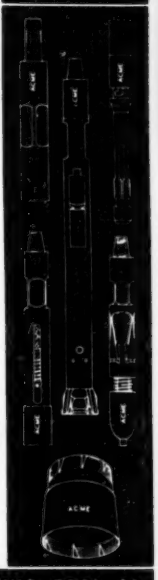

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ARKANSAS WILDCAT FAILURES

Columbia County: Floyd P. Wilson 1 Stevens, NE NW 15-16s-19w, dry, TD 3,637 ft., Nacatoch 1,682 ft., Saratoga 2,010 ft., base annona 2,268 ft., James 3,338-66 ft., Three Finger 3,550 ft.

Grant County: C. A. Lee 1-A International Paper Co., approximately C 2-5s-14w, dry, TD 2,687 ft.

OHIO FIELDS

Deepened Well Has Good Show

COLUMBUS.—W. C. Adair et al., deepened their 3 William Bratton, Lot 24, Hopewell Township, Licking County, and found a good showing of oil in the Clinton at 2,830-70 ft. In the first 24 hours after shot, the well made 84 bbl.

Sheffield Oil completed a small well on 2 Jacob Burch, Section 18, Jackson Township, Knox County. Clinton sand at 3,037-81 ft. was shot with 150 qt. and made 25 bbl. in 24 hours.

Sharp & Davis have drilled in the 1 Crooksville China Co., Section 16, Harrison Township, Perry County, with 6 bbl. natural from the Clinton at 3,433-78 ft. The well was shot with 115 qt., but the results have not been reported yet.

Hannah Coal Co.'s 1 fee, Section 13, Short Creek Township, Harrison County, found water in Berea sand at 1,518-63 ft., and is being drilled on down to the Gordon horizon.

J. A. Upham has moved in for a Clinton test on Henry Chaney in Section 10, Warren Township, Tuscarawas County, a mile south of the 1 A. H. Johns. In Dover Township, Hambleton et al., will drill the 1 Alvin Lind in Lot 29, ½ mile southeast of 1 George Yackey.

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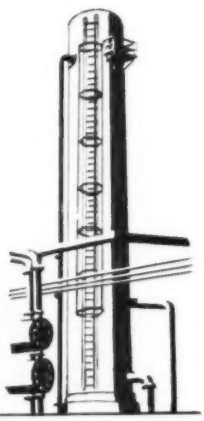

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Hamilton County Wildcat Flows Clean Oil on Test

C. E. BREHM has a prospective discovery well in the Bungay area 6 miles southwest of Mill Shoals, Hamilton County, Illinois, where his 1 Smith, NE SE NE 16-4s-7e, flowed clean oil in a drill-stem test of Aux Vases sand at 3,269-85 ft. In the test, gas showed within 41½ minutes after the tester was opened and oil was at the surface within 55 minutes. No water was indicated. Hole has been deepened to the McClosky, where additional showings were reported with bottom at 3,420 ft. The well is about a mile from any other production, this being to the east in the Bungay pool.

Testing is under way at another promising discovery well located in the area 5 miles northwest of Mt. Vernon, Posey County, southwestern Indiana. The well is C. E. Skiles 1 Aldridge, NW NE SW 34-6s-14w. Pay zone being tested is the Benoist sand, found at 2,483-2,505 ft. A drill-stem test at 2,493-2,505 ft. yielded 205 ft. of clean oil with a good showing of gas. Oil-string is at 2,480 ft. The area is about 2 miles northwest of production in the Mt. Vernon pool.

Aurora Gasoline Co. and associates 1 Jackson, NE SW SE 10-6s-13w, which opens another new area about 6 miles north of Mt. Vernon and about 8 miles to the northeast of the Skiles discovery, same county, is being put on the pump for completion after swabbing tests in which it made up to 200 bbl. of oil daily. Nearest other oil production is in the Farmersville pool, about 2 miles to the southwest.

A small, Pennsylvanian sand well is being completed by F. B. Cline at his 1 Ogle, NE NE SW 32-8n-9w, a wildcat located about a mile to the east of the Sullivan producing area in Sullivan County, Indiana. It tested 8 bbl. of oil daily before shooting with sand at 680-87 ft. Since then the sand has been shot with 8 qt. of nitro. Operators now are cleaning out for additional tests.

Illinois Mid-Continent Co. 1 Leighty, NE NW SE 20-3n-11w, ½ mile from production on the east side of the south part of the Lawrenceville pool, Lawrence County, Illinois, flowed at the rate of 500 bbl. of oil daily through ½-in. choke at completion. It is one of the best producers ever completed in the general area. Pay zone is McClosky lime at 1,822-28 ft. with bottom of the hole at 1,829 ft. The area is about 3 miles southeast of Lawrenceville.

A new pay zone for the area 2 miles southwest of St. Phillips, Posey County, Indiana, appears to have been found by W. C. McBride, Inc., at 1 Reitman, NW SW NW 27-6s-12w. It is the Mansfield sand, in which a drill-stem test at 1,123-1,205 ft. yielded 405 ft. of clean oil with an additional 160 ft. of oil-cut mud. The sand is being passed up pending testing of the Cypress sand zone of the area to which the well was deepened. Cypress is at 2,320-25 ft. with casing run to 2,314 ft.

ILLINOIS WILDCAT FAILURES

Clark County: W. Dayton 1 Page, SE NW SE 5-11n-10w, dry, TD 2,088 ft.

Effingham County: T. B. Dirickson 1 Haack, SW SW SE 34-7n-7e, dry, TD 2,924 ft.

C. Hayes 1 Sterrett, NE NW SW 32-9n-5e, dry, TD 2,235 ft.

Gallatin County: Ashland Oil & Refining Co. et al 1 Shea, NE NE NW 32-9s-9e, dry, TD 2,350 ft.

B. A. Baker 1 Glasscock, NW SW SE 25-7s-8e, dry, TD 3,030 ft.

Lawrence County: Gopher Drilling Co. 2 Tucker, NW SE NW 6-2n-12w, dry, TD 1,586 ft.

Macon County: Carter Oil Co. 1 Henneberry, NE NE NE 25-15n-3e, dry, TD 2,717 ft.

Richland County: Herndon Drilling Co. 1 Grubb, NE NE SE 19-3n-11e, dry, TD 3,384 ft.

White County: Ashland Oil & Refining Co. 1 W. R. Cochran et al, SW SE SW 23-5s-9e, dry, TD 3,281 ft.

Tuley and Carter 1-A Stocke, NW SW NE 32-4s-9e, dry, TD 3,425 ft.

INDIANA WILDCAT FAILURES

Daviess County: Nation Oil Co. 1 Raber, SW NW NW 13-3n-6w, dry, TD 1,259 ft.

F. E. Poe 1 Eaton, NE NW NW 21-4n-7w, dry, TD 1,515 ft.

J. R. Shake 1 Hart, SW NW NE 12-4n-6w, dry, TD 732 ft.

Parke County: F. B. Simpson 1 Baysinger, NE SW SW 15-14n-6w, dry, TD 1,210 ft.

Sullivan County: John Zanetis 1 Thompson, SW SW SE 31-9n-10w, dry, TD 2,650 ft.

EASTERN KENTUCKY

ASHLAND—In the Beech Bottom area of Clinton County, southern Kentucky, Hall & Soliday have a dry hole at 1 Leo Edwards. From an elevation of 1,126 ft., the Beaver sand was topped at 556 ft., and Devonian black shale at 560 ft. This test was bottomed at 1,410 ft. in the Ordovician with only a light show of gas at 1,011 ft.

Also in Clinton County, and near the 76 Pool, Bardill & Eleason failed at 1 Lou Davis. Operators topped the black shale at 62 ft. and drilled into the Knox dolomite with top as yet undetermined. At a total depth of 1,709 ft. operators found the hole full of water and have plugged this test.

In Fleming County, 20-V-70, Walter Kline et al., are drilling below 1,528 ft. on 1 James Bashford, rank wildcat for the area. Drilling is currently progressing in the Knox dolomite series with no showings to date.

EASTERN KENTUCKY WILDCAT FAILURE

Carter County: A. H. Carpenter 1 Virgil Ramey, 25-X-78, dry, TD 3,840 ft., Berea 828 ft., Corniferous 1,392 ft., Tyrone 2,980 ft., St. Peters 3,590 ft., good show oil; Knox 3,606 ft., water 3,836-40 ft.

WESTERN KENTUCKY SUCCESSFUL WILDCAT

Henderson County: Joe Reznik 1 Trigg, NW NE NE 21-P-21, IP 80 bbl., McClosky 2,583-88 ft., TD 2,591 ft. (Opens Midway pool).

WESTERN KENTUCKY WILDCAT FAILURES

Muhlenburg County: C. E. Skiles 1 Lee, CSL SW SE NW 15-1-28, dry, TD 2,030 ft.

Webster County: W. F. Lacey et al 1 Russell, NE NW SW 18-M-23, dry, TD 3,201 ft.

Link-Belt Elects D. E. Davidson Vice President

Link-Belt Co. has announced that David E. Davidson has been elected vice president for sales, with headquarters at executive offices in Chicago. All officers who served last year were reelected.

Davidson, a mechanical engineering graduate of Armour Institute of Technology, has been general manager at the company's Pershing Road plant, Chicago, since 1947. He entered the employ of the company's Caldwell plant, Chicago, in 1924.

Announcement was also made that Eugene P. Berg, formerly assistant general manager, has been appointed general manager of the Pershing Road plant, to succeed Davidson. Berg, a mechanical engineering graduate of Purdue, began his Link-Belt career by working in the Pershing Road shop during vacations, 1929 to 1937.

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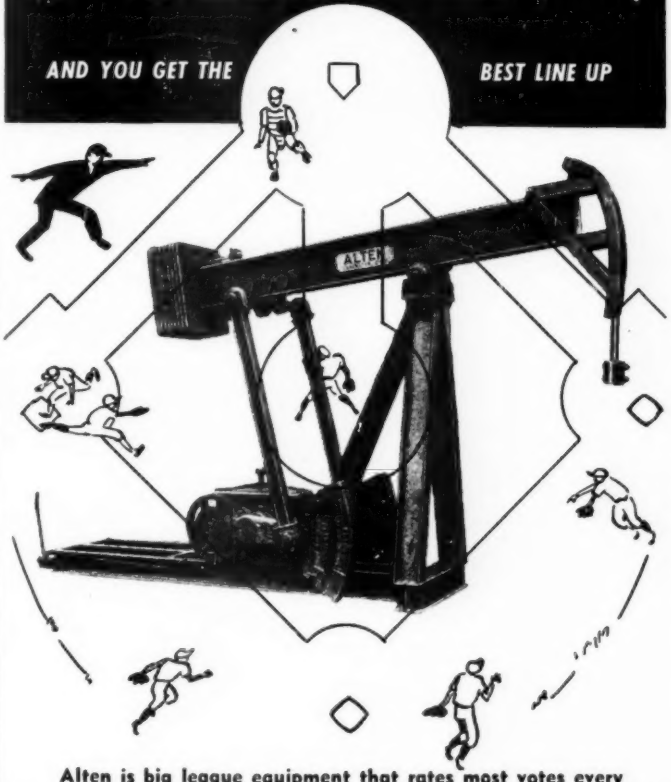

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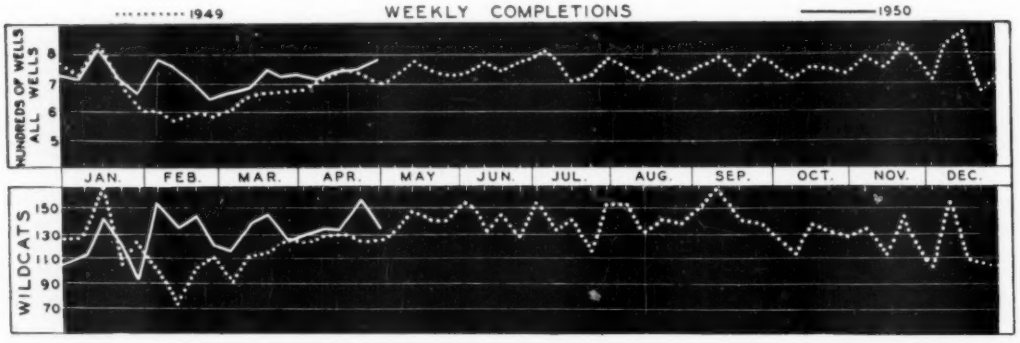
CURRENT STATISTICS

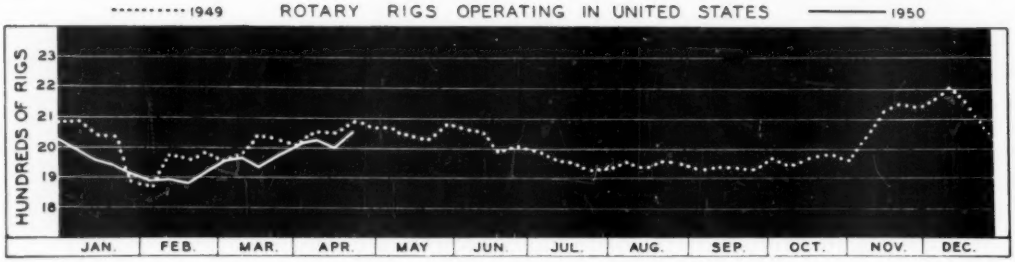
EXPLORATION

WEEKLY WELL COMPLETIONS . . . WEEK ENDED APRIL 29, 1950

	Total of all wells					Apr. 29		Wildcat completions and discoveries					Cumulative total, 1950				
	Comp.	Oil	Gas	Dry	Footage	1950	1949	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	6	*3	0	*3	7,842	153	447	0	0	0	0	0	0	0	0	0	0
Pennsylvania	15	6	4	†5	27,115	347	718	0	0	0	0	0	0	0	0	0	0
West Virginia	8	0	7	1	25,156	191	168	0	0	0	1	1	0	0	4	8	12
Ohio	10	4	4	2	22,916	289	365	0	0	0	0	0	1	0	1	5	7
Indiana	21	6	0	‡15	36,759	341	344	0	0	0	5	5	9	0	1	57	67
Kentucky	25	10	7	8	53,476	289	268	1	0	0	3	4	6	0	1	22	29
Illinois	44	20	0	24	106,495	689	658	0	0	0	10	10	11	0	0	169	180
Michigan	18	11	1	6	41,576	211	285	1	0	1	5	7	11	0	3	86	100
Kansas	60	31	5	24	185,542	1,124	931	0	0	0	8	8	23	0	2	163	188
Nebraska	0	0	0	0	0	21	11	0	0	0	0	0	0	0	1	11	12
Oklahoma	113	60	3	*50	374,786	1,631	1,276	1	0	0	15	16	45	3	7	211	266
Texas	318	227	9	82	1,289,258	4,943	4,226	9	0	0	43	52	155	11	39	790	995
North Central (Dist. 7-B & 9)	114	74	0	40	318,980	1,562	1,363	5	0	0	18	23	54	2	11	290	357
West (Dist. 7-C & 8)	94	78	0	16	485,194	1,442	915	2	0	0	9	11	40	1	0	163	204
Panhandle (Dist. 10)	16	12	4	0	47,582	324	319	0	0	0	0	0	1	0	2	8	11
Eastern (Dist. 5, 6, & 6-P)	31	27	1	3	118,618	342	317	2	0	0	1	3	5	1	1	75	82
Gulf Coast (Dist. 2 & 3)	37	20	3	14	218,916	664	611	0	0	0	8	8	28	3	13	102	146
Southwest (Dist. 1 & 4)	26	16	1	9	99,968	609	701	0	0	0	7	7	27	4	12	152	195
Louisiana	65	41	6	18	415,172	744	638	1	1	0	8	10	22	6	4	63	95
Northern	34	20	5	9	122,406	389	325	0	0	0	1	1	4	0	1	27	32
Southern	31	21	1	9	292,766	355	313	1	1	0	7	9	18	6	3	36	63
Arkansas	13	9	0	4	41,585	115	91	0	0	0	2	2	1	0	0	28	29
Mississippi	9	5	0	4	68,726	106	119	2	0	0	3	5	6	1	0	38	45
Southeastern States	2	0	0	2	5,479	21	18	0	0	0	2	2	0	0	1	14	15
Montana	1	0	0	1	6,842	47	62	0	0	0	0	0	0	0	0	9	9
Wyoming	14	13	0	1	81,227	177	174	1	0	0	0	1	5	0	0	22	27
Colorado-Utah	1	0	0	1	4,063	19	33	0	0	0	1	1	0	0	0	16	16
New Mexico	11	8	2	1	58,354	208	178	0	0	0	0	0	7	0	0	18	25
California	31	22	0	9	113,699	551	861	0	0	0	9	9	9	0	2	104	115
Miscellaneous	1	0	0	1	2,068	6	13	0	0	0	1	1	0	0	0	6	6
Total United States	786	476	48	262	2,968,136	12,203	11,884	16	1	1	116	134	311	21	66	1,810	2,238
Total previous week	749	430	33	286	2,875,333			23	0	1	133	157	295	20	65	1,724	2,104
Total April 30, 1949	744	425	60	259	2,647,226			23	1	4	99	127	292	25	56	1,652	2,025

Service wells included: *3, †5, ‡1.





DAILY AVERAGE PRODUCTION FOR WEEK

	Apr. 29 crude oil	B.of M. Apr. demand	Apr. 22 crude oil
Alabama	1,450	1,000	1,450
Arkansas	80,300	83,000	80,050
California	857,600	842,000	858,000
Colorado	58,800	66,000	58,800
Eastern	60,300	60,900	60,425
Florida	975	900	1,200
Illinois	179,200	182,000	175,500
Indiana	28,500	27,000	27,800
Kansas	272,900	280,000	284,050
Kentucky	26,300	25,000	25,700
Louisiana	513,450	548,000	513,200
North Louisiana	118,450		118,200
South Louisiana	395,000		395,000
Michigan	44,400	45,000	44,600
Mississippi	97,350	99,000	97,500
Montana	24,500	25,000	23,900
Nebraska	1,500	1,100	1,500
New Mexico	125,800	132,000	125,800
Oklahoma	423,750	415,000	435,700
Texas	1,982,850	2,060,000	1,982,850
Dist. 1 (Southwest)	26,475		26,475
Dist. 2 (Southwest)	118,900		118,900
Dist. 4 (Southwest)	187,700		187,700
Dist. 3 (Gulf Coast)	348,300		348,300
Dist. 5 (Eastern)	30,550		30,550
Dist. 6 (Eastern)	80,250		80,250
East Texas field	258,000		258,000
Dist. 7-C (West)	47,875		47,875
Dist. 8 (West)	601,850		601,850
Dist. 7-B (W. Central)	63,100		63,100
Dist. 9 (N. Central)	130,550		130,550
Dist. 10 (Panhandle)	89,300		89,300
Utah	3,000	1,100	3,000
Wyoming	160,100	136,000	159,100
Total United States	*4,943,025	5,030,000	4,960,125
Change from previous wk., down	17,100		
Canada	66,160		63,740
Total U. S. production January 1-April 29			†590,073,330 bbl.
Same period last year (crude plus cond.)			629,712,720 bbl.

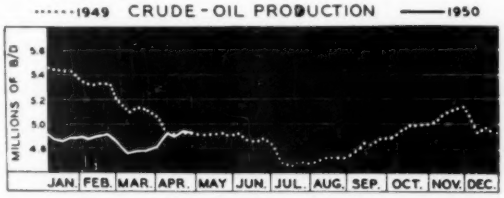
*Not incl. 101,460 bbl. condensate. †Incl. 11,210,780 bbl condensate.

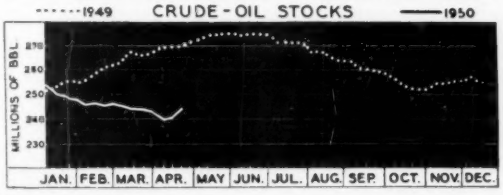
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

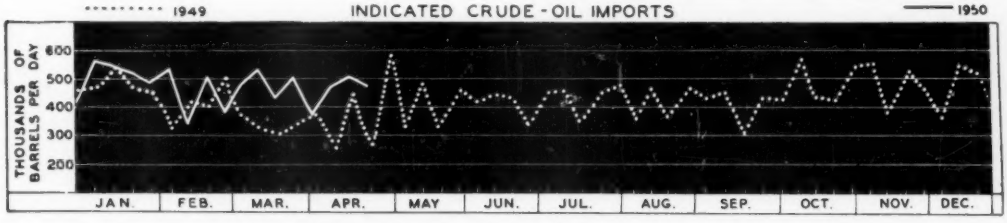
(Thousands of barrels)

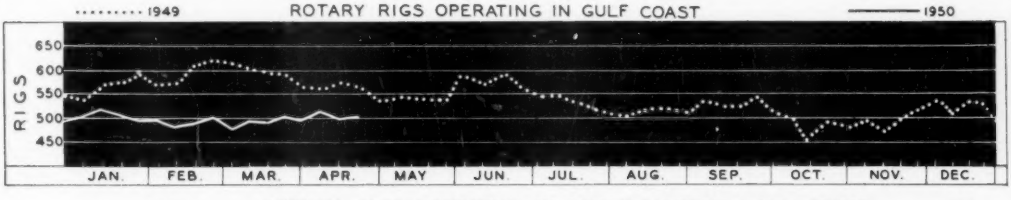
	Apr. 22, 1950	Apr. 15, 1950	Apr. 23, 1949
Pennsylvania	2,777	2,742	3,024
Other Appalachian	1,643	1,512	1,887
Illinois, Indiana, Michigan	9,247	9,860	14,335
Arkansas	3,009	3,034	3,242
Louisiana	15,961	14,816	14,051
North	3,434	3,362	3,433
Gulf	12,527	11,454	10,618
Mississippi	2,356	2,472	2,925
New Mexico	6,395	6,549	7,409
Oklahoma and Kansas	35,810	35,283	38,585
Texas	107,878	106,729	129,385
East Texas	14,876	14,223	17,916
West Texas	38,705	39,251	52,217
Texas Gulf	27,517	27,467	30,043
Other Texas	26,780	25,788	29,209
Rocky Mountain	13,468	13,442	13,440
California	38,128	38,174	34,264
Foreign	7,439	6,711	7,284
Total	244,111	241,324	269,831

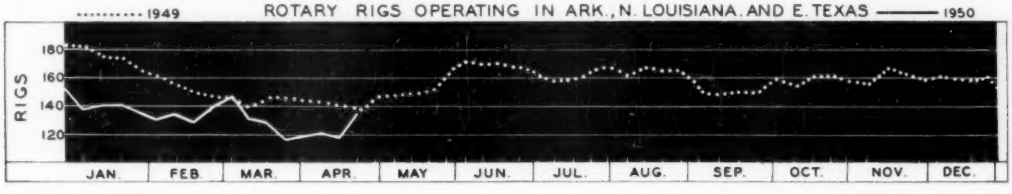
*Bureau of Mines.









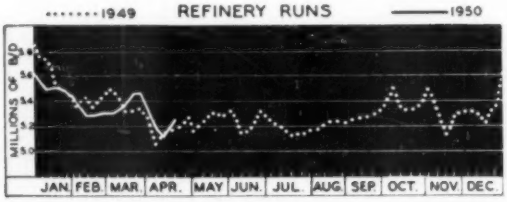


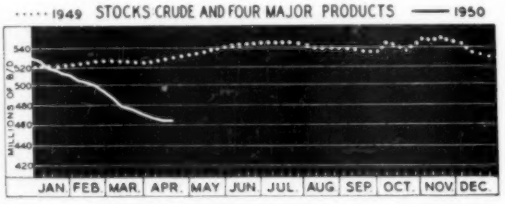
A.P.I. REFINERY REPORT, APRIL 22

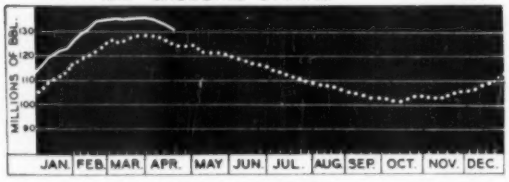
(Thousands of barrels)

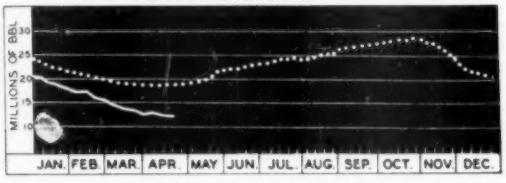
District	Daily avg. crude runs	Daily average production				Stocks at refineries, bulk terminals, in transit and in pipe lines				Bureau of Mines, April 1949				
		Gasoline*	Kerosine	Distillate	Residual	Gasoline†	Kerosine	Distillate	Residual	Daily avg. crude runs	Daily average production			
											Gasoline*	Kerosine	Distillate	Residual
East Coast	894	380.6	30.4	182.6	226.5	26,824	4,958	9,840	9,104	736	308.3	31.3	137.5	184.5
Appalachian:														
District 1	80	33.0	6.4	10.6	10.3	2,430	234	388	251	86	39.3	4.8	10.5	8.8
District 2	78	36.6	5.0	9.7	18.3	1,122	70	93	158	67	33.9	3.6	5.8	16.2
Ind., Ill., Ky.	998	482.1	62.3	164.1	140.4	28,084	1,852	4,348	2,245	857	456.5	49.3	125.0	127.0
Okla., Kans., Mo.	442	253.0	17.0	88.9	67.6	14,180	511	2,522	733	394	214.2	22.5	78.3	64.2
Inland Texas	176	132.0	11.6	26.0	40.4	3,844	246	683	590	213	143.5	13.5	18.6	47.5
Texas Gulf Coast	1,061	484.7	68.3	251.9	206.9	20,119	1,492	5,881	3,074	1,235	616.6	75.1	216.1	220.3
La. Gulf Coast	451	239.1	53.0	104.4	47.2	7,173	1,639	2,248	1,968	430	221.7	46.9	93.2	54.9
N. La. and Ark.	74	24.3	6.3	14.6	15.1	2,672	308	565	171	73	27.2	6.4	11.8	14.7
Rocky Mountain:														
New Mexico	13	7.1	.4	2.0	2.7	99	25	54	30	12	6.7	.4	1.6	3.1
Other Rocky Mtn.	169	82.6	1.7	39.0	30.7	5,114	301	1,317	446	143	60.7	5.0	27.0	35.9
California	830	366.6	5.0	130.1	292.0	19,605	797	9,182	20,997	895	365.8	13.4	120.2	370.1
April 22, 1950	5,266	2,521.7	267.4	1,023.9	1,098.3	131,266	12,433	37,121	39,767	5,141	2,494.4	272.2	845.6	1,147.2
April 15, 1950	5,116	2,402.9	292.0	966.7	1,077.3	133,458	12,686	37,499	39,831					
April 23, 1949	5,188	2,513.6	273.6	869.6	1,178.0	124,749	18,361	49,775	59,617					

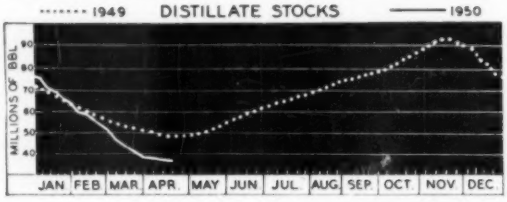
*At refineries including natural blended. †Finished and unfinished.

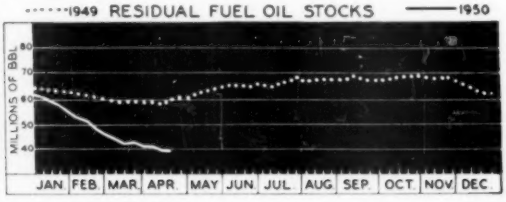


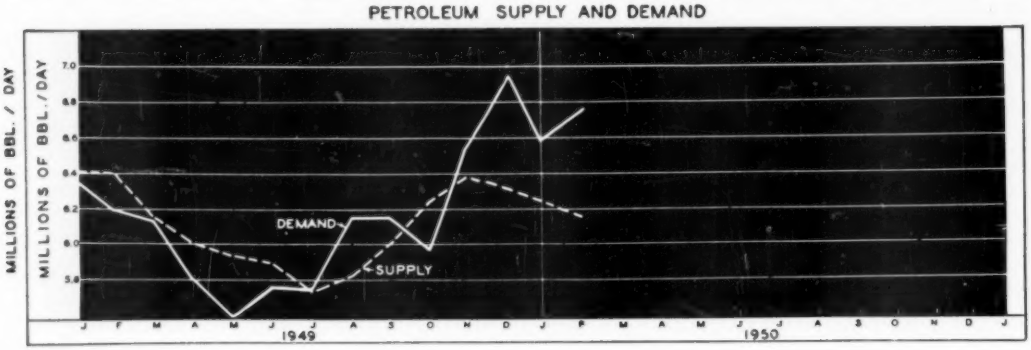











PETROLEUM SUPPLY AND DEMAND
MILLIONS OF BBL. / DAY
MILLIONS OF BBL./DAY
DEMAND
SUPPLY
J F M A M J J A S O N D J F M A M J J A S O N D J
1949
1950

CRUDE PRICES
GRAVITY SCHEDULE

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.53			
19-19.9	1.63			
20-20.9	1.73	$2.25		$2.12
21-21.9	1.82	2.27		2.14
22-22.9	1.92	2.29		2.16
23-23.9	2.02	2.31		2.18
24-24.9	2.12	2.33	$2.56	2.20
25-25.9	2.22	2.35	2.58	2.22
26-26.9	2.31	2.37	2.60	2.24
27-27.9	2.37	2.39	2.62	2.26
28-28.9	2.42	2.41	2.64	2.28
29-29.9	2.48	2.43	2.66	2.30
30-30.9	2.54	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.64	2.49	2.72	2.36
33-33.9		2.51	2.74	2.38
34-34.9		2.53	2.76	2.40
35-35.9		2.55	2.78	2.42
36-36.9		2.57	2.80	2.44
37-37.9		2.59	2.82	2.46
38-38.9		2.61	2.84	2.48
39-39.9		2.63	2.86	2.50
40 and above		2.65	2.88	2.52

*For crude from Daboval, El Campo, and Sand Point.

†Includes Lea County, New Mexico. Last general price change represented a 50-cent increase becoming effective December 6, 1947. Above changes do not include recent reductions of a few buyers applying principally to low-gravity grades.

FLAT CRUDE PRICES

Representative posted schedules per barrel.

East Texas†	$2.65
Kettleman Hills, California*	2.77
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	2.35
Bradford, Pennsylvania	3.65
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°, †35° and above.

GASOLINE prices at most East Coast points are stabilizing at higher levels following recent increases announced by major suppliers. Esso Standard Oil Co. advanced prices in its territory for all methods of delivery for an average increase of about 0.7 cent a gallon effective April 25. The New York Harbor price for barge delivery was raised 0.9 cent a gallon to 11.5 cents. This is the price that existed last fall before the series of reductions starting in October.

East Coast increases have been the direct result of much stronger gasoline markets on the Gulf Coast. Gulf-East Coast stocks of gasoline were reduced more than 1,500,000 bbl. in the 2-week period ended April 22, and reductions for all areas averaged 275,000 bbl. daily for the same period. This rate of withdrawal is a little above normal for the season despite late cold weather in the northern states which boosted end-of-season heating-oil demands. The end result has been a reduction in total major-product inventories for the past 4 weeks amounting to more than 10,000,000 bbl., compared with a reduction of only 200,000 bbl. in the same period last year.

Mid-Continent gasoline prices strengthened with many operators reporting that quality gasoline is hard to find. Total gasoline stocks dropped more than 1,000,000 bbl. in the Mid-Continent and North Central district for 2 weeks ended April 22. Some of the farm demand for these areas has been delayed by cold weather in the northern states. Residual demand in the inland areas remains unusually strong. Most suppliers expect continuing high demands for several months but little change in price.

Group 3 price for grade 26-70 natural gasoline increased $\frac{3}{8}$ cent a gallon to 4.75 cents under the influence of increasing motor-fuel demands.

REPRESENTATIVE QUOTATIONS

Representative spot-market quotations of leading suppliers as of May 1, 1950. Figures are f.o.b. plant for tank-car shipments in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor (barge)	Texas Gulf Coast
Regular gasoline, 80-82 octane	9¾-10	11.5	10-10¼
Premium gasoline, 86-88 octane	10½-11	12.5	10½-11
42-44 w.w. kerosine	8½-8⅝	8.8	7¾-8¼
No. 2 straw fuel oil	7⅝-7¾	7.6	6⅝-7
No. 6 residual	$1.60-1.65	$2.05	$1.65-1.75

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	4¾	4½	4½
Grade 18-55	5.7	5.2	5.45

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	10.5
750 vis., No. 3-4 neutral	12.75
2,000 No. 5-6 neutral	14-14.5

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	17
200 vis., No. 3 neutral, 0-10 pp.	11.5-12.5

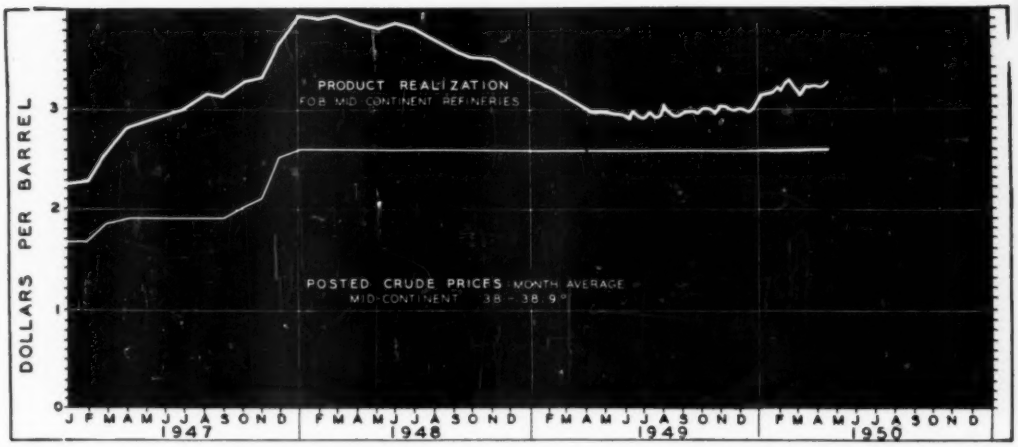
Western Pennsylvania

145-155 vis., 10 p.t. bright stock	19
180 vis., 0 p.t. neutral	20

WAX

Mid-Continent

132-134 A.M.P.	4.50


DOLLARS PER BARREL
3
2
1
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PRODUCT REALIZATION
FOB MID-CONTINENT REFINERIES
POSTED CRUDE PRICES 1 MONTH AVERAGE
MID-CONTINENT 38 - 38.9°
J F M A M J J A S O N D
1947
J F M A M J J A S O N D
1948
J F M A M J J A S O N D
1949
J F M A M J J A S O N D
1950

In this trend chart refinery realization is based on average Mid-Continent grade crude oil (not 38° gravity only) and average prices for refinery products as published in The Oil and Gas Journal basis Oklahoma (Group 3). Refinery yields confined to gasoline, kerosine, distillate, and fuel oil

EQUIPMENT MEN . . . in the News

Halliburton Is Host to Oklahoma Chemists

The Oklahoma section of the American Chemical Society met Thursday, April 13, at Duncan, Okla., to hear an address by the associate director of the National Bureau of Standards, Washington, D. C. Pictured are Hayden Roberts, laboratory manager for the Halliburton Oil Well Cementing Co., host for the meeting; Dr. Wallace R. Brode, associate director of the federal testing agency; and Dr. Bernard O. Heston, chemistry professor at University of Oklahoma.

Dwight Evans Organizes Tulsa Consulting Firm

Dwight Evans, formerly Houston branch manager of Branson Instrument, Inc., has moved to Tulsa as a consulting engineer. Branson Instrument, Inc., manufactures the "Audigage," an ultrasonic metal-thickness tester for measuring metal wall thickness.

Evans is now exclusive distributor for this instrument throughout the Southwest. He also operates a consulting and engineering inspection service utilizing this equipment.

Evans is a graduate of Kansas University, and was formerly employed as an engineer by Phillips Petroleum Co. from 1939 to 1948.

Sprinkle Is Assistant Sales Manager for Republic

H. H. SPRINKLE

Howard H. Sprinkle has been appointed assistant sales manager of Republic Rubber Division, Lee Rubber & Tire Corp., G. L. Smith, Republic's sales manager has announced. Sprinkle started with Republic in the order and billing department in 1923. He was transferred to the sales department and in 1933 was made sales representative. Since 1933 he has represented Republic in the Cleveland and Buffalo areas.

Lincoln Names Additions to Sales Engineering Staff

The welding engineering staffs of several of the district offices of Lincoln Electric Co., Cleveland, have been increased recently. R. G. Todd has been added to the staff of the Lincoln Tulsa office. He is a mechanical engineer, a graduate of Vanderbilt University.

J. W. Brooks is now serving the Boston area as welding engineer. Brooks is a graduate of Cornell University in mechanical engineering. J. J. Chemerys is serving industrial accounts in the Syracuse territory. He is a graduate of Penn State in industrial engineering and worked for Joy Manufacturing Co. before joining Lincoln.

W. R. Karll has assumed sales and engineering responsibilities in the Lincoln Newark office. After graduating from Harvard Business School, he worked for several organizations selling and as an industrial-management consultant.

Guiberson Names Ragsdale

Guiberson Corp. has announced appointment of R. G. Ragsdale as a field sales and service representative to be located in Houma, La. Ragsdale was formerly with Republic Supply Co. in Louisiana and Wyoming.

Transcontinental Signs for G. E. Microwave System

John F. Burton, vice president of Transcontinental Gas Pipe Line Corp., signs a contract with General Electric Co. for the world's longest microwave radio communications system. Looking on are: L. W. Goostree, G. E. communications sales manager of Syracuse; Claude A. Williams, president, Transcontinental Gas Pipe Line Corp., Houston; H. G. Randolph, G. E. electronics district sales manager, Dallas; and Louis Paine, G. E. district communications representative, Houston.

Monlux Elected President Of Acetylene Association

Claude E. Monlux, vice president, Linde Air Products Co., New York, was elected president of the International Acetylene Association at the annual business meeting held during this organization's annual convention in San Francisco, in March. Monlux had served as vice president for the year 1949.

James W. Dunham, vice president, National Cylinder Gas Co., Chicago, was elected vice president of the association. E. V. David, assistant manager of the technical sales division, Air Reduction Sales Co., New York, was reelected treasurer, and H. F. Reinhard was reelected secretary.

Wallace to Manage Visco Gulf Coast Division

Carl L. Wallace has been appointed Gulf Coast division manager for Visco Products Co., with headquarters in Houston. He was formerly district representative covering northern Louisiana and southern Arkansas.

Vernon G. McBride is replacing Wallace, and he will make his headquarters in Ruston, La. Aubrey L. Adams has been appointed district representative covering the Houston area, replacing David E. Murphy, who has been transferred to district representative in California with headquarters in Long Beach. Paul H. Mallette has been appointed district representative with headquarters in El Campo, Tex., and will cover that area.

Allen Made Manager of Venezuelan Consultants

IRWIN B. ALLEN

Irwin B. Allen, formerly of Tulsa, has been appointed manager of Petroleum Industry Consultants, C.A., Caracas, Venezuela, vice president H. F. Rodner, Jr., announced. Allen has been associated with United Oilwell Service, S.A., of Caracas for the past year as diamond coring and sales engineer. Before going to Venezuela he was with Stanolind Oil & Gas Co. as an engineer.

Petroleum Industry Consultants, C.A., service in Venezuela includes well-pickup service of cores, oil and gas samples, and forwarding them to Petroleum Engineering Associates, Inc., laboratory in Pasadena, Calif., for analysis.

Arrangements are under way to also offer well-side core-analysis service in Venezuela by the company. Sales and service of Drilling & Service, Inc.'s core barrels and Wheel Trueing Tool Co.'s Truco diamond core bits in Venezuela and Colombia, are others of its services.

Atchley to Direct Tracerlab Engineering

Tracerlab, Inc., has announced the appointment of Dana W. Atchley, Jr., as director of engineering. Atchley has been sales manager of Tracerlab since 1947. The newly formed engineering division will include electronic and mechanical engineering designs.

Concurrently, William A. Kerr has been appointed general sales manager. Kerr has been with American Optical Co. for 9 years in executive sales capacities. Tracerlab has sales offices in Boston, New York, Chicago, and Berkeley, Calif., and Paris, France, in addition to 13 foreign distributors.

Kaylo Shifts Dallas Branch to Houston

J. K. DIXON

W. M. Hankins, Jr., general sales manager, Kaylo Division, Owens-Illinois Glass Co., manufacturer of heat insulating and structural calcium silicate material, has announced the transfer of its Dallas branch to Houston and appointment of J. K. Dixon as sales engineer for the Houston territory.

Dixon's territory will include the

Continental Holds Annual Sales Meeting in Dallas

One of the features of Continental Supply Co.'s annual sales meeting was this group meeting of Continental personnel only at which time officials of associated manufacturers appeared individually to discuss new products and sales techniques.

Continental Supply Co., Dallas, held its annual sales meeting late in March at the Baker Hotel in Dallas. In addition to Continental officials and sales representatives from all divisions and offices, the meeting was attended by executives of Youngstown Sheet & Tube Co., and Emsco Derrick & Equipment Co.

Sessions were conducted by Fredrick M. Mayer, president; Frank I. Brinager, executive vice president; and Jack A. Mussler, manager of sales, all of Continental. Representatives from Youngstown included Walter Watson, first vice president, and J. L. Mauthe, vice president. Emsco was represented by Hugh Glenn, president, and W. L. Powell, Bill Kinder, and C. L. Lamkin, vice presidents.

Gulf Coast east to Florida, the entire state of Louisiana, and Texas as far north as Waco and San Angelo. Another new branch, Oklahoma City, will be added soon.

Establishment of the Houston and Oklahoma City offices will widen the territory formerly covered by the Dallas branch. The Kaylo Division produces heat-insulating block, pipe insulation, insulating roof tile, and laminated panels for curtain-wall construction. T. F. Sears, former Dallas branch sales engineer, has been appointed to the general office in Toledo, as supervisor of roof-tile sales for the entire Kaylo Division.

Long Back From Venezuela

Jack Long, sales engineer for Oil Base, Inc., has returned to the head office at Compton, Calif., after 5 months in Venezuela, where he supervised the use of Black Magic oil-base drilling fluid during drilling operations in various fields throughout Eastern and Western Venezuela.

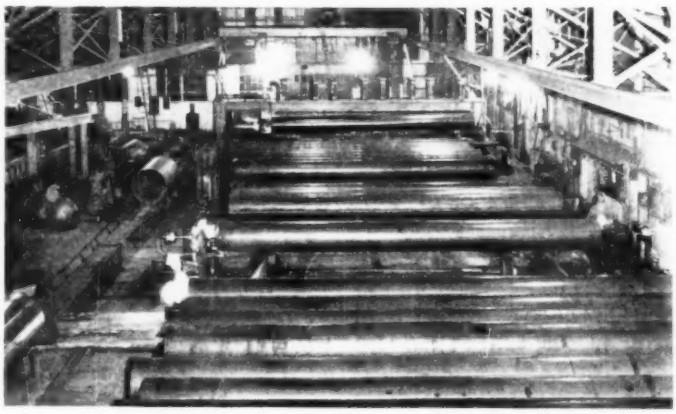
Core Lab Sends Salesmen To Study Oil Base Products

Seven men from the sales engineering staff of Core Laboratories, Inc., Dallas, headed by W. E. Stiles, manager of sales, have gone to Los Angeles to undergo an intensive 10-day training course in the use of Black Magic oil-base drilling fluid, White Magic oil-emulsion mud, and other mud products manufactured by Oil Base, Inc., Compton, Calif. Under the new marketing pact signed last November, Core Lab is sole distributor for Oil Base products in all territories east of California and in Canada.

These seven men are the first to receive training at the source. Under the supervision of George Miller, president of Oil Base, the men visited the California oil fields for viewing the products under actual working conditions and conferred with the men using them. They spent several days at the plant inspecting the products being manufactured and tests were performed in the laboratory under the guidance of D. L. Wilson, director of research at Oil Base. Sales and service instruction was given the men by Thad Randolph, sales manager of Oil Base.

Those who received this training were Bill Stiles, Bill Brown, Roy Hightower, John Jacobsen, Bill Hilliard, Vincent Thomas, and Dick Willshusen. They are stationed at Core Lab district offices in the Rockies, Mid-Continent, and Gulf Coast, and will return to their posts.

McNamar Boiler Announces Pipe Fabricating Facilities



In the background is the hydraulic expanding machine installed at the pipe-fabricating plant of McNamar Boiler & Tank Co. at Tulsa. In the foreground are beveling machines.

McNamar Boiler & Tank Co., Tulsa, has announced its entry into the manufacture of large-diameter expanded line pipe during the fall of 1949. Initial production at the McNamar plant was started during January 1950 and first shipments were made to El Paso Natural Gas Co. for installation on the 30-in. line El Paso is constructing from West Texas to California.

Complete facilities have been installed to produce an anticipated 5,000 tons of 30-in. diameter line pipe a month. Individual joints of pipe being manufactured at McNamar are 32 ft. long. After forming and welding, the pipe is placed in a hydraulic expanding machine which encloses it in steel jackets and applies hydraulic pressure inside the pipe, expanding it to finished diameter and making it perfectly round and straight. Beveling machines are built into the conveyor system and the joints are fed automatically into position for beveling.

Federal Truck Expands Sales Organization

W. L. HAYES

Expansion of Federal Motor Truck Co.'s sales organization has been announced by Carl Loud, general sales manager.

Walter L. Hayes, formerly head of the company's eastern field organization, has been promoted to assistant general sales manager with headquarters at Detroit. Hayes joined the company in 1948.

Harry L. Norton, a member of the sales department since 1946, has been named truck-distribution manager and will serve on Hayes' staff.

W. A. Knechel has been elevated to the post of assistant general sales manager of the eastern territory. Knechel has held the post of factory sales representative in the Philadelphia region since 1946.

Charles A. Phillips has been appointed as factory sales representative in the Denver region. An industrial engineer, Phillips will supervise dealer relations and coordinate merchandising and sales activities for the company in Colorado, New Mexico, and southern Wyoming.

Du Pont Announces Four Personnel Changes

Four changes in personnel of E. I. du Pont de Nemours & Co., Inc.'s, petroleum-chemicals division which handles sales of tetraethyl lead antiknock compounds and other chemicals to the petroleum industry have been announced.

Joseph L. Stecher has been appointed assistant sales director of the division. He was manager of petroleum chemicals production.

Emory M. Fanning has been named assistant sales director of Kinetic Chemicals, Inc., manufacturer of Freon fluorinated compounds for the refrigeration, air-conditioning, and aerosol industries. Fanning formerly was petroleum chemicals sales manager.

E. Hearn Simpson and David H. Conklin have been appointed sales managers of the division, Simpson to have charge of industrial sales, Conklin to direct sales promotion. Both were assistant sales managers of the division.

(Continued on page 203)

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY... CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 12c a word one issue. 10% Discount three or more issues. $3.00 minimum charge. Blind Box in our care counts nine words. Payable in Advance.

DISPLAY CLASSIFIED
$12.00 a column inch one issue . . .
10% Discount three or more issues.

EQUIPMENT FOR SALE

ONE new 40′ x 40′ x 12′ corrugated aluminum building; double sliding door; single door and window; steel structure. Located: Bunkie, Louisiana. Anchor Gasoline Corp., Phone 54-5201, Tulsa, Oklahoma.

1—5″ x 8″ FD-FXX Gardner-Denver Power Pump; 1—5″ x 8″ FD-FXX Gardner-Denver Power Pump mounted on skids with PA-100 International engine. Chapman Pipe & Supply, Box 4232, Oklahoma City, Oklahoma.

REBUILT BOILERS

85 HP., Broderick Oil Field Type Boiler, S.W.P. @ 175#. Complete with standard trim. Peerless Boiler Company, 421 North Cincinnati, Tulsa; 2015 NE Park Place, Oklahoma City.

FOR SALE

5—Used "Caterpillar" D13000 Power Units with Gaso Model 1742 5x10 pipeline pumps, complete with skids, V-belt drive—and guard—Immediate Delivery.

JOHN FABICK TRACTOR COMPANY
St. Louis, Mo.
Phone: LAclede 8900 L.D. 5

16″ O. D. PIPE

20,000′ 42.05# Lapweld, 20′ random lengths, Plain End. Used, good condition. Location: Mansfield, Ohio, vicinity.

MID-STATES PIPE & SUPPLY CO.
Ph. 2-9128 Tulsa, Okla.

SURPLUS NEW REFINERY MATERIAL: VALVES, FITTINGS, PACKINGS, TUBES, ELECTRICAL & INSTRUMENT PARTS.

THE STANDARD OIL CO. (Ohio)
Attn.: Mr. R. L. Charles,
1401 Midland Bldg., Cleveland 15, Ohio

FOR SALE
NEW—50% TO 75% LESS THAN REPLACEMENT COST
EXPLOSION PROOF
Motors & Controls Conduits
Flowrators 3″—$60.00 Telephones—$110.00
Power Weighing Scales Lights—$35.00
Side Entering Mixers 25HP—$200.00
Vapor Steam Generators—$250.00
Simpson Mixers, Pumps, Valves, Meters, Filters, Gas & Oil Hose.

GENERAL TRADERS, INC.
2675 W. Grand Ave., Chicago 12, Ill.
Phone: AR 6-8050

EQUIPMENT FOR SALE

FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
Box 107, Red Fork Station, Tulsa, Oklahoma

FOR SALE: 36-L Bucyrus Spudder. A-1 condition. Complete line of drilling tools 15″ down. Sand pumps, swabs, dog house and light plant. New 4000′ lines. No Junk! Located Oklahoma. Box 378, Cherryvale, Kansas.

FOR SALE: Wilson Mogul drilling rig with portable derrick complete. Suitable for 4500′ depth. Now running in Bebee Field, Pontotoc County, Oklahoma. Contracts available. Lake Oil Company, Ada, Oklahoma.

1 String Complete Rotary Drilling Tools, with Lee C. Moore Heavy Duty Mast, Cardwell Draw Works, 7¼ X 14 Wheland Pump and W.A.K. Waukesha Motor. Tools located near Olney, Illinois. Priced right to sell. Either call 48542 or write H. M. Williams Drilling Company, 701 Bitting Building, Wichita, Kansas.

PACKAGED H_2S REMOVAL UNITS

We offer prompt shipment on skid mounted hydrogen sulfide removal units for treating sour gas for pipe line or fuel gas purposes.

GRAFF ENGINEERING & EQ'PT. CO.
3415 Westminster, Dallas 5, Texas

6—Guaranteed used horizontal welded steel tanks, 8′ in diameter, 32′ long, 5/16″ wall, bulged heads
1—NEW heavy welded steel tank, 7′6″ in diameter, 13′6″ long, approx. ⅝″ shell, ¾″ bulged heads
3—NEW vertical welded steel tanks, bulged heads, 4′8″ in diameter, 18′8″ high, approx. 1½″ thickness, with stands
20—Guaranteed used vertical welded steel tanks, 10′4″ in diameter, 17′4″ high, approx. ⅜″ wall, dished heads, manhole on side, complete with iron stands—DOUBLE COATED ON INSIDE WITH GUSMER'S MAMMUT—LIKE GLASS ENAMEL. (Can also be used horizontally).
100—New and Guaranteed used A.P.I. bolted type steel tanks from 250 bbl. to 10,000 bbl. inclusive.
50—New and Guaranteed used welded and riveted steel tanks up to 74,000 bbl. capacity.
150—Guaranteed used closed vertical Cypress WOOD tanks, approx. 10′ in diameter, from 8′ to 18′ high, complete with round hoops and lugs.

Your inquiry will be appreciated.

A. GREENSPON PIPE CO., INC.
3615 Olive St. St. Louis 8, Mo.
LUcas 5651

EQUIPMENT FOR SALE

FOR SALE
(SUBJECT TO PRIOR SALE)
3 Bolted tanks, 2 in original crates and one assembled, (100 Bbl.). 69′-14″ 57# Drive Pipe; 170′-10¾″ 41# Drive Pipe; 407′-10¾″ 32.75# Casing 8Rd. Thd. Smls.; 3045′-8″ 24# Casing 8Rd. Thd. Smls.; 6286′-7″ 23# Casing 8Rd. Thd. Smls.; 8101′-3″ 9.20# Tubing Smls.; 1453′-2½″ Tubing EUE Smls.; 14,220′-2″ 6.40# Regular 10Rd. Thd.; 375′-¾″ Pumping rods; 9-5″ Orbit Gate Valves; 9-3″ Orbit Gate Valves; 3-2″ Orbit Gate Valves; 3-2⅞″ x 6″ Parmco Combination Packer; 1-2⅞″ x 6″ Larkin Screw Trip Packer; 1-3″ x 6″ Parmco Packer; 1-2⅞″ x 6″ Gas Anchor Packer. M. B. Belden Office at 425 2nd St. N. W., Canton 2, Ohio, Phone 4-6147.

FOR SALE: Model L-107 Allis-Chalmers Fred E. Cooper winch unit for deep well servicing. Excellent condition. Priced to sell. Degen Pipe & Supply Co., Box 107, Red Fork Station, Tulsa, Oklahoma.

SEISMOGRAPH EQUIPMENT FOR SALE: Two 2-Ton Chevrolet Coleman 4-Wheel Drive water trucks. 500 gallon tank completely winterized, vacuum fill, Tulsa winch, etc. Excellent condition, low mileage. Original Cost $6600.00—Sale Price $4000.00.

One ½-Ton Chevrolet crew and field service unit. Bed enclosed with steel, cab with heater, 65 gallon gas tank with gear pump. 7:50 x 15 tires. Low mileage. Original Cost $2800.00—Sale Price $1800.00. Riverside-8811, Dallas, Texas.

NEW PETROLEUM HOSE, metal lined canvas covered, 2″ x 8′6″ coupled two males at $6.00 and 2½″ x 19′ coupled M & F at $10.75 f.o.b. Racine. Bratt & Lang, Box 207, Racine, Wisc.

FOR SALE: 4850′ Spang 13.30# 3½″ Drill Pipe—Used very little—Protectors. 1—3½″ Kelly—New, 1—6′ x 38′ Subbase, 3—16′ x 24′ x 3.5′ pipe racks, Walkway and stairway. Located Newcastle, Wyoming. Contact: Graham Powell Drilling Co., Centralia, Illinois.

FOR SALE: New 10,000 Bbl. API Columbian Bolted Steel Tank with tools $6500 FOB Newark, N. J. Darien Corp., 60 E. 42nd St., N.Y., N.Y.

NEW YALE & TOWNE Truck Pumps, 200 GPM capacity at $125.00. New Yale & Towne Bulk Plant Pumps, mounted on base ready to receive electric motor at $192.00. Write for specification on pumps and our catalog on petroleum equipment. Bratt & Lang, Box 207, Racine, Wisc.

FOR SALE—Several used Mayhew 1000 and 600 rotary type drills, mounted on 2-ton Chevrolet trucks. Many in operation at present. Inquire at 8800 Lemmon Ave., Dallas 9, Texas. Phone Dixon 4-2671.

8000′ ¾″ & ⅞″ new Jones Type 7 sucker rods; 1—deep well pumping unit. Priced to sell. Simmons & Wilson, Hotel Stockton, Fort Stockton, Texas.

Several Army Surplus 4½″ x 6″ Gaso Duplex 1860 Pumps—two piece skid mounted with Chrysler 8 cylinder engines. Will sell pumps only or complete units about half price.

H. H. COFFIELD
ATTN: W. H. Orr
Phones: 132—Rockdale, Texas
A-86084—Houston, Texas

TANKS FOR SALE

8—55,000 bbl. 5 ring, complete shell and bottom only, riveted, 140 tons, plates 6′x20′, rivets backed out, match-marked, loaded on cars, $6500.00 each.

3,000 tons Ring Sheets with rivets backed out, ⅜″ to ½″ thickness, 5′ x 15′ size, @ $50.00 per ton, loaded on cars, Tulsa.

P.O. Box 1858 W. C. BERRY Tulsa, Oklahoma

EQUIPMENT FOR SALE

CARDWELL RL SPUDDER. Completely equipped. Good operating condition. Located Central Oklahoma. For prices and terms write: Barnes Drilling Company, 22 West Fourth St., Tulsa, Oklahoma.

FOR SALE: Two $2\frac{1}{2}$" x $1\frac{1}{2}$"—One 3" x $1\frac{1}{2}$"—One 3" x $1\frac{3}{4}$"—Two 4" x $1\frac{3}{4}$"—Four 4" x 2" Conventional Type Kobe Production Pumps. These Pumps are in good condition, are ready to run. Peppers Refining Co., 2917 First National Bank Building, Oklahoma City, Okla.

FOR SALE: One, type-100 National Drilling Rig has drilled only two wells. With 800,000 pounds capacity jack-knife derrick. Box D-448, The Oil and Gas Journal, Tulsa, Oklahoma.

50,000 ft.—$1\frac{1}{4}$" new extra strong seamless steel pipe, random lengths, plain end

GUARANTEED USED SEAMLESS STEEL BOILER TUBING

50,000 ft.—$1\frac{1}{2}$" O.D., 9 gauge
120,000 ft.—2" O.D., 10 to 11 gauge
150,000 ft.—$2\frac{1}{4}$" O.D., 10 to 11 gauge
60,000 ft.—$3\frac{1}{4}$" O.D., 9 gauge
45,000 ft.—$3\frac{1}{2}$" O.D., 10 to 11 gauge
20,000 ft.—$3\frac{1}{2}$" O.D., $\frac{3}{8}$" wall
25,000 ft.—4" O.D., 9 gauge
60,000 ft.—$5\frac{3}{8}$" O.D. and $5\frac{1}{2}$" O.D., 8 gauge

All of our used tubing is cleaned and tested for 850# hydrostatic pressure

15,000 ft.—6" O.D. guaranteed used welded steel pipe, $\frac{1}{8}$" wall, plain end
10,000 ft. $6\frac{5}{8}$" O.D. guaranteed used standard seamless steel pipe, 19#, plain end

GUARANTEED USED LAPWELD STEEL PIPE, PLAIN END

12,000 ft.—$8\frac{5}{8}$" O.D., 24#
9,000 ft.—$8\frac{5}{8}$" O.D., 28#
6,000 ft.—$10\frac{3}{4}$" O.D., 40#
2,000 ft.—$12\frac{3}{4}$" O.D. guaranteed used Naylor spiral weld steel pipe, 7.32" wall

We carry large quantities of both new and guaranteed used steel pipe and tubing up to 36" in diameter.

Your inquiry will be appreciated.

A. GREENSPON PIPE CO., INC.
3615 Olive St. St. Louis 8, Mo.
LUcas 5651

100 OCTANE GASOLINE REFINERY

Liquidation Sale!

Inventory Includes

$100,000 in
Tanks, Towers, Vessels.
$100,000 in
Pumps, Turbines, Motors.
$75,000 in
Heat Exchangers, Condensers.
$25,000 in
Laboratory Equipment.
$75,000 in
Instruments and Controls.
$200,000 in
New Refinery Parts and Supplies.
$30,000 in
Stainless Steel Pipe.
Available Immediately

WRITE—WIRE—PHONE

DULIEN STEEL PRODUCTS, INC.
of Washington
P. O. BOX 667
COTTON VALLEY, LA.
PHONE: COTTON VALLEY 26

EQUIPMENT FOR SALE

FOR SALE—127' "Oilwell" Drilling Mast, 515,000 capacity, complete with six-foot substructure. Call or write H. Waggoner, Phone 64-1413, or P.O. Box 4657, Oklahoma City, Okla.

WAR SURPLUS MACHINERY

Gaso, Byron Jackson, Aurora, Wayne Lombard, & Hale Fire Pumps with Engines, $1\frac{1}{2}$ to 25 KW Generator Sets or Light Plants, Engines, Suction Hose, Fire Hose, Victaulic Couplings & Etc. Write for listing. H. A. McCarthy, 310 Thompson Bldg., Phone 5-3296, Tulsa, Oklahoma.

FOR SALE: Two strings of $4\frac{1}{2}$" O.D. Drill Pipe. This pipe has not seen much use and is in excellent condition. There are 5000' of $4\frac{1}{2}$" O.D. Hughes Full Hole Bottleneck Tool Joints, API Threads. Also 3300' of $4\frac{1}{2}$" O.D. Hughes Full Hole, API Threads. Would be interested in selling outright or trading for $5\frac{1}{2}$" and 7" Casing. Joe Golden, Box 1362, Odessa, Texas. Phone No. 2542.

WELL SERVICING UNIT: 1945 Cardwell Model H complete with tools mounted on 1942 Tandem truck. Write: Box D-475, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 36-L Bucyrus Erie with Spang tools. 319 E. 7th Street, Owensboro, Kentucky. Phone 3-6135.

FOR SALE: 1—36-L Bucyrus Rig, 1948 model, complete with all tools. Phone 2032. Henderson, Kentucky.

BOILERS FOR SALE: 18 Code Oil Field Boilers, 50 to 87 H.P., 100 to 200 Lbs. W.P. Operated under Hartford into 1948, not fired since. Located on Leases vicinity Pampa, Texas. Offered subject to prior sale $500.00 to $700.00 Each, as is where is. Contact W. L. Godfrey or Max Harbison, Kewanee Oil Company, Pampa, Texas.

1 BUCYRUS-ERIE 36L Spudder with third leg, A-1 condition, latest model, new lines, $\frac{7}{8}$" & $\frac{3}{4}$" x 4000', complete with dog house, light plant, 210 bbl. welded tank on skids, drilling tools, casing outfit, $15\frac{1}{2}$" to 6", sills, derrick floors and house, 1948 $2\frac{1}{2}$ Ton Dodge Winch Truck, and 3 Ton Dual Wheel Trailer.

1 Bucyrus-Erie 36L Spudder, 1948 Model, A-1 Condition, new lines, $\frac{7}{8}$" & $\frac{3}{4}$" x 4500', complete with dog house, light plant, 57' A-Mast, drilling tools from $15\frac{1}{2}$" to $5\frac{1}{2}$", derrick floor and house and all necessary timbers for drilling big hole; 1948 Model $\frac{1}{2}$ Ton Chevrolet Pickup. Russell Drilling Co., Box 572, Russell, Kansas.

SKID MOUNTED Double Drum Spudder. 6500 foot capacity, double mast with or without tools. Bargain. Box D-457, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE Skid mounted 5 x 10 Gardner Denver Pump with 525 Buda Engine used to drill five shallow holes—$3000.00. Riverside 6811, Dallas, Texas.

EQUIPMENT WANTED

WANTED: 1500 Failing or similar size drill. Truck mounted. Must be complete and ready to drill. Give complete description, price and location. No Junk wanted. Box 378, Cherryvale, Kansas.

INTERESTED in small portable double-mast rig, capable of drilling to approximately 2000 feet, with or without drill pipe. Equipment must be in good condition and reasonably priced. Preferably located in Southwest Texas. Contact:

MAKIN DRILLING COMPANY
Box 131, Hobbs, New Mexico, Phone 131

WANTED

Hyster Winches Towing or Worm Drive Models D8N — D7N — D6N and D4N.

JOHN FABICK TRACTOR COMPANY
3100 Gravois, St. Louis, 18, Mo.
Phone: Laclede 8900. L.D. 5

BUSINESS OPPORTUNITIES

FOR SALE: Established Well Servicing business located in Illinois. Equipment in good condition. Doing nice business. Box D-473, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

NATIONAL oil trade publication has exceptional opportunity on editorial staff for graduate engineer preferably with two or more years experience in field work. Writing experience desirable. Box D-482, The Oil and Gas Journal, Tulsa, Okla.

FOREIGN and Domestic Oil Employment Directory (including late supplement of oil companies and drilling contractors in Western Canada). Over 500 listings in drilling, production, refinery, natural gasoline, pipelines, geological, exploration, supplies, manufacturers, services and refinery and pipeline contractors, showing where to apply for jobs. Price $5.00. Oil Industry Mailing List, Box 2603, Tulsa, Okla. (Our 30th year)

WANTED: Man located in West Texas to handle technical specialities, on commission, such as control valves, steam traps, etc., under well known organization with main offices and warehouse in Houston. Prefer man already established but desires to extend his activity. Box D-469, The Oil and Gas Journal, Tulsa, Oklahoma.

REFINERY PROCESS ENGINEER

Experienced man, engineering degree, for mid-continent independent refinery having 20,000 bbl. daily thruput. Facilities include thermal and catalytic cracking, furfural-vacuum & M.E.K. dewaxing units. Responsible position, unusual opportunity. Please list full experience, background, age, & salary required. Replies will be held confidential. Box D-476, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTRUMENT ENGINEER

Graduate Engineer with several years' experience in the selection of automatic control instruments for petroleum processing plants, required by engineering and construction company operating internationally. Initially for service in New York Office.

Box D-463, The Oil and Gas Journal, Tulsa, Okla.

WANTED
EXPERIENCED ENGINE SALESMAN
FOR GULF COAST AREA

Will be stationed at Houston. Must be acquainted with territory and oil industry's personnel. Our own staff knows about this ad.

Box D-472, The Oil and Gas Journal, Tulsa, Oklahoma

SITUATIONS WANTED

12 YEARS experience design, supervision, management refinery gasoline plant engineering & construction. Charge of up to 100 engineering personnel handling $20,000,000 volume. Age 34. Registered Engineer, B.S. plus graduate work. Desire connection with established consultant or operating company. Would consider retainer fee basis with smaller companies. Box D-481, The Oil and Gas Journal, Tulsa, Oklahoma.

ATTENTION: Well established oil well drilling contractor desires to manage and supervise: Individuals', groups', small or medium-sized oil companies' drilling, production and operating problems in Central and Western Texas, and New Mexico. Personal interview by appointment is desired. Makin Drilling Company, Box No. 131, Ph. No. 131, Hobbs, New Mexico.

PRODUCTION and Drilling Supervisor: Desires immediate change. 8 years with major, Illinois basing drilling, completion, production, and equipment; 1 year oil field construction. Graduate Petroleum Engineer. Age 31, family. Box D-467, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED: Connection as Land and Lease man, production experience and wildcat operation experience in Texas, Oklahoma and Kansas desires to cover Mississippi, Alabama and Tennessee getting protection acreage or forming drilling blocks, scouting included. Production now, in Alabama and Tennessee and several wells drilling. Kay W. Thorsen, 2106 Lee Place, Memphis, Tenn.

SITUATIONS WANTED

GRADUATE CHEMIST: 10 years experience in soap products, synthetic rubber, quality control, supervision. Write: Box D-465, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER: Refinery, Gasoline Plant. B.S. in Petroleum Engineering. Six years varied petroleum experience in Laboratory, Drafting, Construction, Instrumentation and Process Design of both refineries and gasoline plants. Box D-478, The Oil and Gas Journal, Tulsa, Oklahoma.

INDUSTRIAL RELATIONS MANAGER: Can relieve Management of all responsibilities labor contract negotiations, grievance handling, safety program, training program, etc. Box 474, The Oil and Gas Journal, Tulsa, Oklahoma.

CORROSION ENGINEER: Nationally known, widely experienced in oil refineries and in application of Cathodic Protection desires change. Sales or contact work considered. Box D-462, The Oil and Gas Journal, Tulsa, Oklahoma.

TWENTY YEARS' EXPERIENCE compressor station, gasoline plant and field construction, operation and management. Desire project management position. Have had production experience. Presently employed. Box D-461, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT - Office Manager - Auditor desires connection with independent oil company that would appreciate a fully qualified middle aged man who is presently employed. Box D-456, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST: Number of years varied experience with major company desires position with Independent concern. Box D-479, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL ENGINEER—29, married, three years on crude, thermal and catalytic cracking in process group of large refinery desires position in sales, operations, etc., where experience plus ability to get along with people will be assets. Box D-480, The Oil and Gas Journal, Tulsa, Oklahoma.

LEGAL BLANKS

BURKHART LEGAL BLANKS since 1908 Oil-Gas (all states), Business, Real Estate Legal Forms, Leases, Revised With Government Regulations, Commercial Printing. Catalog and Samples on request. Burkhart Printing & Stationery Company, 115 South Cincinnati, Tulsa 3, Oklahoma

FOR LEASE

ATTRACTIVE office space to lease in new oil building in Key West Texas oil city—Abilene, Texas. Ready for occupancy on or about Sept. 1st. Fire-Proof, Year around air-conditioning, janitorial service and parking space adjacent to building. Modern selected office arrangements. Contact Jimmy Partin, Tel. 8561, Abilene, Texas.

WANTED

WANTED: SURPLUS Chemicals, Oils, Waxes, Solvents, Wastes and Residues of all kinds. Chemical Service Corporation, 98-06 Beaver St., New York 5, N. Y.

PATENT ATTORNEYS

PATENT Practice before U. S. Patent Office. Validity and Infringement Investigations and Opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine & Rommell Registered Patent Attorneys, Suite 418 815-15th Street, N.W., Washington 5, D. C.

SERVICES

OIL WELL CEMENTING AND ACID SERVICE EQUIPMENT

BUILT TO ORDER

FOR PRICES, SPECIFICATIONS, ETC. WRITE:

FRED R. HOLLAND
Fort Worth Club Bldg., Fort Worth, Tex.

ROYALTIES

DEEDED ROYALTIES

San Juan Basin & Permian Basin. Write Harry S. Wright, Wright Bldg., Farmington New Mexico.

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EQUIPMENT MEN

(Continued from page 200)

Paul Courtney Appointed As Emsco Vice President

Paul Courtney, manager of Emsco's Houston plant operations, was appointed vice president of Emsco Der-

PAUL COURTNEY

A. H. MILLER

rick & Equipment Co. at the directors' meeting following the annual meeting of the company's stockholders held in Los Angeles.

Courtney has been with Emsco since 1938 and has been manager of Emsco's Houston plant operations since 1946. Also appointed at the directors' meeting was A. H. Miller, who was named secretary and treasurer of the company. Miller has been with Emsco for 21 years and was secretary and assistant treasurer before his new appointment.

Moxness Gets New Position With Brown Instruments

John B. Moxness has been appointed industry engineer in charge of sales promotion of control devices for Brown Instruments Division of Minneapolis-Honeywell Regulator Co. Moxness' promotion was announced by L. Morton Morley, M-H vice president and general sales manager of the Brown division.

Ottumwa Iron Appoints Colombe Export Manager

Lou Mervis, president of Ottumwa Iron Works, Ottumwa, Iowa, has announced the appointment of M. H. Colombe as export manager at the company's newly established export office at Chicago.

This firm, which has been in operation since 1867, is a manufacturer of speed reducers, sykes-generated spur and continuous-tooth herringbone gears, mine hoists, and component and replacement gears and parts for steel plants, oil fields, and other industrial and processing plants.

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CALENDAR

May

National Stripper Well Association, Biltmore Hotel, Los Angeles, May 7-9.

Independent Petroleum Association of America, midyear meeting, Biltmore Hotel Los Angeles, May 7-9.

American Gas Association, Natural Gas Department, spring meeting, Mayo Hotel Tulsa, May 8-9.

Liquefied Petroleum Gas Association, annual convention, Palmer House, Chicago May 8-11.

American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles, May 11-12.

American Petroleum Institute, central committees on accident and fire prevention, midyear meeting, Atlantic City, N. J., May 15-18.

American Gas Association, production and chemical conference, Hotel New Yorker, New York, May 22-24.

American Institute of Chemical Engineers, regional meeting, New Ocean House, Swampscott, Mass., May 28-31.

Gas Technology Short Course, Texas College of Arts and Industries, Kingsville, Tex., May 29-31.

June

National Oil Scouts and Landmen's Association, Skirvin Tower Hotel, Oklahoma City, June 8-10.

American Society of Mechanical Engineers, oil and gas power division, Lord Baltimore Hotel, Baltimore, June 12-16.

Pennsylvania Grade Crude Oil Association, Hotel William Penn, Pittsburgh, Pa., June 15-16.

Petroleum Equipment Suppliers Association, annual membership meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., June 18-20.

American Society of Mechanical Engineers, Hotel Statler, St. Louis, June 19-23.

Canadian Gas Association, annual convention, Manoir Richelieu Hotel, Murray Bay, Quebec, June 19-24.

Kentucky Oil and Gas Association, annual meeting, Lexington, Ky., June 22-23.

American Society for Testing Materials, annual meeting Chalfonte-Haddon Hall, Atlantic City, N. J., June 26-30.

American Petroleum Institute, midyear division of production and standardization conference, Brown Palace Hotel, Denver, June 26-30.

July

Institute of Petroleum, oil shale and cannel coal conference, Glasgow, Scotland, July 3-7.

August

Interstate Oil Compact Commission, summer meeting, French Lick, Ind., August 3-5.

September

National Chemical Exposition, Chicago Coliseum, Chicago, September 5-9.

American Society of Mechanical Engineers and Instrument Society of America, Municipal Auditorium, Buffalo, N. Y., September 11-15.

National Petroleum Association, Hotel Traymore, Atlantic City, N. J., September 13-15.

Instrument Society of America, annual instrument conference and exhibit, Memorial Auditorium, Buffalo, N. Y., September 18-22.

American Society of Mechanical Engineers, petroleum mechanical engineering conference, Roosevelt Hotel, New Orleans, September 25-27.

October

American Gas Association, annual convention, Atlantic City, N. J., October 2-6.

Mid-Continent Oil and Gas Association, Texas division, Dallas, October 4-5.

Petroleum Branch, American Institute of Mining and Metallurgical Engineers, Mid-Continent meeting, Roosevelt Hotel, New Orleans, October 4-6.

NOMADS

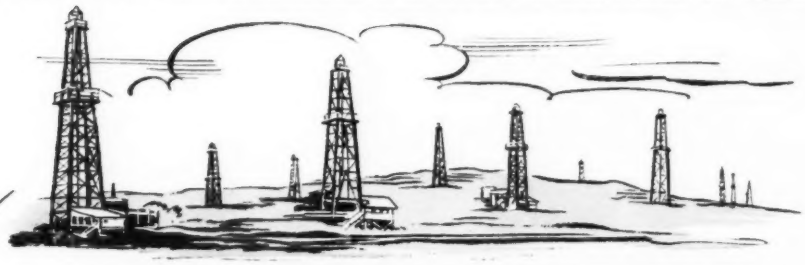
Tulsa Nomads, third Friday of each month. After Five Room, Tulsa Hotel.

Dallas-Fort Worth Nomads, first Monday of each month, Greater Dallas Club.

Houston Nomads, second Monday of each month, Ye Ole College Inn, Houston.

Los Angeles Nomads, second Wednesday of each month, Jonathan Club.

New York Nomads: May 10, annual invitation dinner, Louis Sherry's, and June 13-15, golf party, Westchester.



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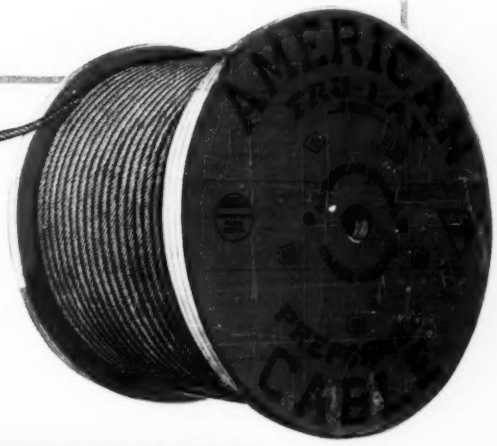

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